UN 1019 DIV. OF M A.

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CXLVI. No. 2921.] LONDON, MAY 6, 1919. [71st Year. Price 8d.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C. 2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

TORBAY
JOINT STOPPING
FREE FROM LEAD.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C. 3.
39/41, Old Hall St., LIVERPOOL.

PUMPING ENGINES
All Types for ACID, &c.
CAST-IRON OR STEEL TANKS
Any Capacity.
CHEMICAL PLANT.
Roofs and Girders. Structural Work.
SULPHATE OF AMMONIA PLANT
Air and Gas Compressors.
MIXERS.
TAR STILLS AND CONDENSERS.
W. NEILL & SON, Ld.
Engineers, Iron & Brass Founders,
ST. HELENS JUNCTION.
Telegrams: 'Neill, St. Helens.' Telephone No. 20.

"BLUEBELL"
SILICA RETORTS
(95% SILICA)
John G. Stein & Co., Ltd.,
Castlecary, SCOTLAND.

PURIFYING MATERIAL
"Brownox-de-Luxe."
Unqualified Satisfaction given where used.
SPENT OXIDE PURCHASED
J. BROWN & CO., Ltd.
Savile Town, DEWSBURY.

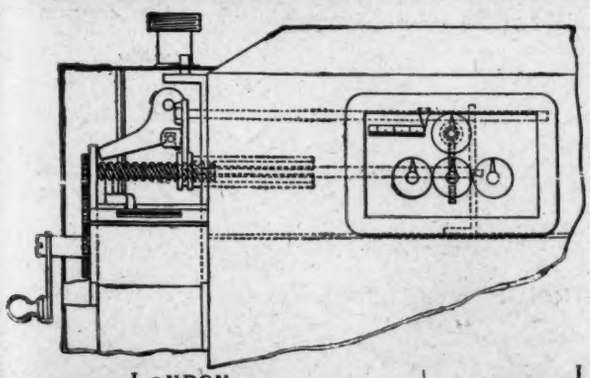
Makers of
GASHOLDERS,
TANKS (C.I. or Steel),
PURIFIERS,
WASHERS,
ROOFS,
&c.
ASHMORE, BENSON, PEASE & CO., LTD.,
STOCKTON-ON-TEES.
Complete GAS WORKS
London Office:
39, Victoria Street, Westminster, S.W.
Telegrams: "GASHOLDER."

W. & B. COWAN
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON. MANCHESTER. EDINBURGH. GLASGOW.
SYDNEY. MELBOURNE. BRISBANE. WELLINGTON, N.Z.
(See Advertisement on page iii. of Wrapper.)

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
89, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

GEORGE GLOVER & CO., LTD.,
CHELSEA.



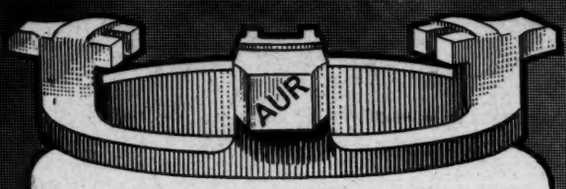
"THE STANDARD"
SLOT METER.
THE ACME OF SIMPLICITY.
NO SPRING in any part of the mechanism.
Can be fitted with **STRONG BOX,** if desired, or with **"M & M" LOCK.**

LONDON:
RANELAGH WORKS,
ROYAL AVENUE, CHELSEA, S.W. 3.
TELEPHONE: 1140 Kensington.
WIRE: "Dry Meters, London."

LEEDS:
9, DEWSBURY ROAD.
TELEPHONE: No. 26463.
WIRE: "Meters, Leeds."

MANCHESTER:
GAYTHORN METER WORKS,
EASTON STREET.
TELEPHONE: No. 6898 City.
WIRE: "Slot, Manchester."

SOLE MAKERS OF THE
RITCHIE C.I. PIPES FOR GAS & WATER. MIDDLESBROUGH.
WESTERHOUSE LANE & COAL WASHES. MANCHESTER.



The Welsbach Light Co., Ltd.

THE
WELSBACH
LIGHT CO., LTD.
Welsbach House,
KING'S CROSS,
London, W.C.1
There Are No Better Mantles Made

is an ALL British Company

The Welsbach Factory produces the largest number of Mantles of all Factories in the United Kingdom.

DONKIN

for

GAS VALVES

SINGLE AND DOUBLE FACED.

EXHAUSTERS, COMPRESSORS, RATEAU TURBO GAS EXHAUSTERS, PUMPS.

THE BRYAN DONKIN COMPANY, LTD.,

Head Offices & Works, CHESTERFIELD.

LONDON OFFICE: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84.
London Telephone No. 5358 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin, Vic. London."

CONTENTS.

EDITORIAL NOTES.

Warnings for the Government—Coal Conservation and Electricity 283
Financial Considerations of the Housing Scheme from the Gas Point of View. . . 283
Cost Rises and Production Developments . 284
Economies in Water Gas Manufacture . . 285
Consolidated Subscriptions—Sales Organization — The New "Eagle" Gas-Range—Small Works and Labour—Fuel and Lighting Rationing—Varying Prices of Benzol—Benzol and Encouragement by the Government 286

Regulation of Coal and Coke Stocks . . . 287
Joint Industrial Council for the Gas Industry 287
Personal 287
Studying the Factors involved in the Manufacture of Carburetted Water Gas . . . 288
Electricity Supply Memoranda 288
North of England Gas Managers' Association—Annual Meeting in Newcastle 290
Removing Clinkers from Water Gas Generators 291
Utilizing Light Oil Recovery Plants . . . 291
Eastern Counties Gas Managers' Association—Half-Yearly Meeting at Bury St. Edmunds 292
Presidential Address 293
Water Gas Plant at Colchester. By W. W. Townsend 296
Ammonium Nitrate as an Explosive . . . 300
Midland Junior Gas Association—Annual General Meeting 301
Manufacture of Gas from Wood—Swedish Experiments and Industrial Practice . . 301
Modern American Purification Practice . . 303

British Commercial Gas Association (Southern District Conference)—
Business Meeting 304
Mr. F. W. Goodenough on the "Work and Policy of the Association". . . 304
"Development of the Sale of Gas." By Mr. F. H. Holland. 307
"Gas Service in the National Housing Scheme." By Mr. W. J. Sandeman . 310
Sunderland Conferences of the "B.C.G.A." 314
Increasing the Utility of Gas in the Home and Factory. By Mr. A. B. Roxburgh 314

REGISTER OF PATENTS.

Production of Oils from Coal Tars and the Like, also Carbon and Pitch free from Uncombined Carbon—Major, J. L.. . . 317
Igniting and Extinguishing Gas-Burners—Radet, L.. 317
Air-Admission Valves for Atmospheric Gas-Burners—Hunter, T. M. 318
Hot-Water Circulators—Fletcher, Russell, & Co., Ltd., and Banks, W.. 318
Manufacture of Sulphate of Ammonia—Sheard, J. T.. 318
Gas-Diverting Valve for Purifiers—R. & J. Dempster, Ltd., and Rodger, W. F.. . . 319
Gas-Purifiers—Milbourne, R. J. 319
Applications for Patents 320

PARLIAMENTARY INTELLIGENCE.

House of Lords—
Progress of Bills. 320
House of Commons—
Progress of Bills. 320
Exemption of Benzol from Taxation . . 320
Lewes Gas-Works and Coal Supplies . . 320

CORRESPONDENCE.

The Fuel Research Board's Report on Gas Standards. 317
Cooking by Gas and Electricity. 317

MISCELLANEOUS NEWS.

Protection of Oil Tanks against Lightning—Inquiry by the Petroleum Executive . . 321
Metropolitan Gas Company of Melbourne—Half-Yearly Meeting 321
Wellington (N.Z.) Gas Company 322
Nelson Gas Department Report 322
Examinations in Gas Engineering—City and Guilds of London Question Paper . . . 323
Chelmsford Gas-Works Transfer—The Provision of the Purchase Money 324
National Sulphuric Acid Association . . . 324
The Largest Gas Utility Company. . . . 324
Current Sales of Gas Products 325
Stock Market Report 327

PARAGRAPHS.

British Commercial Gas Association Conferences 288
Southern District Association of Gas Engineers and Managers 295
Benzol for the Dye Industry—Treatment of White Pine with Creosote. 303
Croydon Gas Company's War Effort . . . 313
New Verticals for Walsall—Brighton Gas Company's Capital—Bombay Gas Company—Hull Corporation and the British Gas Light Company 320
Contemplated Extensions at Coventry . . 324
Output of Gas at Halifax. 325
Labour Day Lighting in Ireland—Extended Use of Gas at Darlington—The Coal Situation at Leeds. 326
Renting Gas Appliances for Small Houses—Floods and Gas Supply in Melbourne—Increase in Price at Gomersal—Price of Gas Stoves and Meters 327

"JOURNAL" OFFICE TELEPHONE.

The "Journal" Office Telephone Number is "6857 Holborn."

HUMPHREYS & GLASGOW, LTD.,

AND

THE UNITED GAS IMPROVEMENT CO., U.S.A.

WATER GAS

BLUE *AND* CARBURETTED.

Humphreys & Glasgow, Ltd. 368,400,000 Cubic Feet Daily.

The U.G.I.Co., U.S.A. - - 777,900,000 Cubic Feet Daily.

OVER ONE THOUSAND MILLIONS CUBIC FEET DAILY.

38, VICTORIA STREET, LONDON, S.W.

Bureau de Bruxelles: 209, Chaussée D'Ixelles.

THOMAS GLOVER & CO., LTD.,

Gas Meter Manufacturers and Engineers,

GOTHIC WORKS, ANGEL ROAD, EDMONTON,
LONDON, N.18.

NOTICE.

We regret we are temporarily unable to receive or send telephonic communications at our Head Office and Works owing to the telephone lines in the district being blown down during the recent bad weather.

In the meantime, telephonic communications may be addressed to our

London Showrooms:

25, PRINCES STREET, OXFORD CIRCUS, W.1.

Telephone No.: MAYFAIR 384.

These communications will be sent on to us immediately by hand.

PARKINSON'S

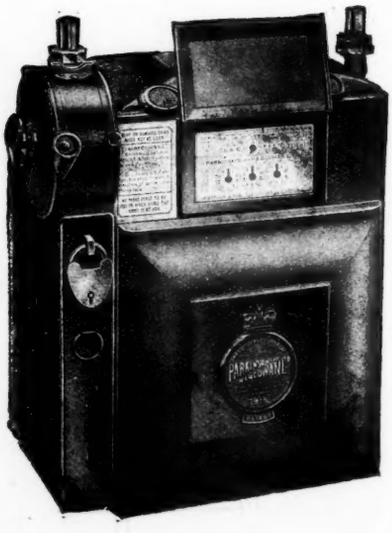
Ordinary & Prepayment

Meters.

Accurate in Registration.

Reliable in Working.

High-Class Workmanship.



W. PARKINSON & CO.,

(INCORPORATED IN PARKINSON AND W. & B. COWAN, LTD.)

COTTAGE LANE, CITY ROAD, LONDON.	BELL BARN ROAD, BIRMINGHAM.	HILL STREET, BELFAST.
Telegrams: "INDEX, LONDON."	"GASMETERS, B'HAM."	"PREPAYMENT, BELFAST."
Telephone Nos.: 7570 City.	2345 Midland, B'ham.	3374 Belfast.

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLVI., No. 2921.] TUESDAY, MAY 6, 1919. [71ST YEAR.

EDITORIAL NOTES.

Warnings for the Government—Coal Conservation and Electricity.

THE Government must now be on the horns of a dilemma in connection with the questions of coal conservation and their gigantic schemes of electricity supply not only for traction and power, but for all purposes in which heat is required. Coal conservation and the electricity schemes are subjects that demand associated consideration. The Government have professed that they are as solicitous about the one as the other. But actions and words count; and what they are proposing in the matter of electricity supply, and what insufficient information has led political persons highly placed to say regarding the latter, are complete evidence that misplaced infatuation and not positive knowledge is the power that leads, and to the detriment of coal conservation. If the Government are honestly and keenly alive to the conservation of our greatest natural asset, and the promotion of its best utilization, they will hesitate, in the national interests, to proceed with their electricity schemes, until they have examined the position on broader grounds than they have yet done, and have taken counsel with men whose knowledge matters, and is not only equal to, but far transcends, that of the Committees (taken as a whole) upon whose advice they are acting. If not, they will be doing an irretrievable injury not only to the nation's coal possessions, but to the gas industry, which, the highest scientific advisers state, makes an enormously better use of coal in the country's interests than the electricity industry.

The Government have been very seriously warned. They have before them the report of the Fuel Research Board as to the future policy that should be adopted towards the gas industry. In this report, it is stated that "the most impor- "tant existing organization for the distribution of potential "heat-energy" is the gas industry; and, further, "for the "supply of heat, gaseous fuel ought to remain supreme, if "its production and use are developed on sound lines." And the Board sketch their views of what are sound lines, and what should now be the policy of the Government in relation to the gas industry [*ante*, pp. 238-240]. Can the Government proceed, and ignore the deliberate opinions of Sir George Beilby, Sir Chas. A. Parsons, Sir A. R. S. Redmayne, and Sir Richard Threlfall? They have also before them a volume presenting the gas industry's case on coal conservation, prepared by Sir Dugald Clerk, Prof. Arthur Smithells, and Prof. John W. Cobb, the conclusions of which authorities were published by us a week ago. Can they ignore a "case" prepared by such men—men renowned and honoured in the scientific world? Can they ignore the clear statement of the present position and prospects of both gas and electricity as users of coal and providers of heat energy which such distinguished authorities present to them? We hope not; indeed, we cannot think they will. To ignore these matters would be for the Government to turn their faces from efficiency and national interests in respect of coal use, and to prosecute the interests of coal waste in respect of heat supply, as distinct from power supply. The data which Sir Dugald Clerk, Prof. Smithells, and Prof. Cobb have submitted, in their valuable report, for the consideration of the Government are there for their investigation. If the data are correct, the Government have sufficient reason for delaying their electrical schemes, and revising them so as best to meet both national requirements and interests. A few months' delay will be better than permanent waste. There is also Prof. W. A. Bone, who was a member of the Power Sub-Committee of the Coal Conservation Committee. In his recent Cantor Lectures, he likewise declared that the use of coal for the production of heat the electrical way was not an economical proposition. Against such a mass of testimony and definite proof by competent men, is it possible that the Government will blindly proceed to carry-out to the full the schemes which electrical interest has propounded without consideration for national advantage, but exclusively for its own benefit? For the life of us, we cannot think what the Government were about in entrusting the investigation of this matter of electricity supply to men some of whom, while competent from the electrical point of view, are certainly not—their report proclaims it to scientific men, if not to politicians—competent from the standpoints of coal conservation and use.

The Government have not gone so far in their commitments regarding electricity that they cannot modify their schemes. At any rate, their proceedings will now show whether haste and proved ill-consideration are to ride supreme over the equally important, and indeed the more important, question of coal conservation and use—whether visionary effects are to have greater weight than solid facts. Their decision will be awaited with interest. Meantime, we hope that the report prepared by Sir Dugald Clerk and his collaborators will have free circulation among members of Parliament and the newspaper press of the country. The report deserves the utmost publicity being given to it without further delay; the interests of the country and of the gas industry demand it. This is not a matter for any petty reserve and childish hesitation.

Financial Considerations of the Housing Scheme from the Gas Point of View.

THE gas industry has its hands pretty full now. The report of the Fuel Research Board has to be closely followed up for all the good it contains in respect of greater freedom in gas production, combined with effort to ameliorate the suggested conditions that modify the advantages. At the other end of its work, the industry cannot, and must not, neglect the opportunity that offers to take part in the great social reformation that is well on the road in the direction of providing better and more convenient housing accommodation for the working classes. What is done now, both at the producing end and at the selling end, is going to make a deep impression upon the fortunes of the gas industry in the future. Let this be the uppermost thought in all open discussion and private consideration. The gas industry cannot afford, at a critical point in its history, not to press to the furthest extent the intrinsic advantages of the position that it occupies.

It is to the selling end and to the housing question that, in this article, we wish to specially direct attention. The revival of the District Conferences of the British Commercial Gas Association has happened opportunely; for as the report of the proceedings at the first one at Reading shows, there are many matters of supreme importance over which to confer. The housing question is one of them. It is very prominent in the minds of every gas manager, and of every gas official within whose province any of its aspects come. It was referred to in the report upon the work and policy of the Association made by the Chairman of the Executive Committee (Mr. F. W. Goodenough). The Association is vigorously doing its part in this direction. It was the subject of a paper by Mr. W. J. Sandeman, the Distributing Engineer of the Croydon Gas Company; and the discussion

which followed indicated the widespread interest there is not only in the constructional details of the houses (for change in which details gas provides scope), but in the financial aspects of the plans so far as they affect gas undertakings. This is the first time there has been open discussion by gasmen upon the subject; and so our report is a full one, as we have here a lead which will form the base for further consideration, with the prospect of more definite agreement. We will leave the constructional details and arrangements, because there is a question of policy which is of the utmost urgency, and which must be viewed very broadly at this stage, unless irretrievable harm is to be done to the industry through missing an opportunity. The plans under contemplation in many places provide for a liberal equipment of gas-consuming appliances, for lighting, room heating, cooking, and hot-water supply. This is going to run into a very considerable outlay. The question is, Who shall pay? Or rather, What is to be the proper division of the outlay as between the property owners and the suppliers of the gas equipment? This is a matter that was fully discussed by Messrs. Goodenough, Higgs, Topley, Creasey, Sandeman, and others.

The first thing that should be ascertained is, what is likely to be the cost under the new conditions, and what is the proper apportionment of this cost, and the terms upon which gas authorities can do their share in supplying the equipment. It is obvious that the provision of (say) the gas-cooker, hot-water apparatus, and gas-copper will necessitate proper structural provision in the scullery. Then comes the question whether dispensing with the old kitchen coal range, and providing a simple fire-grate with boiler at the back to seasonally co-operate with the gas-heated arrangements, would not about balance structural costs (excluding apparatus) in this part of the premises. On the other hand, in all other rooms the adoption of gas-fires in place of coal grates should mean a revolution in house design by eliminating not only coal-grates but the chimneys and the space absorbing chimney breasts—seeing that the gas-fire merely demands a small flue left in the brickwork, with a mantel affixed to the wall, in order not to let the gas-fire stand in nakedness as though occupying a position at the side of the room without premeditation. There is something to be saved here, if the bricks, mortar, labour, and coal grates, and space have any value. How much is the saving? And how much of it can go towards paying for the equipment under the new conditions? We cannot tell. The estimation of this is work for a progressive architect, taking materials and labour at their present market values. We hope the British Commercial Gas Association will immediately take this matter into consideration with professional assistance, and give the industry the information upon which they can make their bargains under the new arrangements. There must not be a simple shifting of cost from the shoulders of the house owners to those of gas undertakings. Enhanced convenience and labour-saving for the tenant will increase the value of the houses; and this should not be forgotten. Architects, however, have never yet thoroughly grasped the possibilities of modifications in house construction that gas appliances offer them; and they, as well as owners, builders, and gas undertakings, would be all the better for the information under specific conditions of what these changes will mean in design and cost.

To look at the matter from another point of view. What will happen if gas undertakings do not rise to this opportunity? We know that money, materials, goods, and labour are dear. The broad view is the one which must be taken. In this matter we have to remember very seriously that the dwellings which are to be erected now will be used as models for future construction. Fashion in houses has its period. It has to be shown that no new type of house will to-day be what it should be without it is equipped with gas as completely as possible, and unless full advantage is taken of the opportunities which such equipment gives for changes in old-fashioned building custom. Therefore, all gas undertakings should, with an eye on the future, take as liberal a view as reason will allow, at this initial stage. If the architects and builders go on in the same old way, it will simply mean the reproduction of coal grates, chimneys, unnecessary labour, money waste, and air pollution as of old, until history repeats itself, and tenants ask for conversion to gas-fires, with all the old unæsthetic work of fitting gas-fires before coal-grates, of which work only convenience and the cost of proper conversion have been the causes of tolerance up to the present. It is now that suitable "sites" for appliances can be provided in the new dwellings; and now that proper piping and connections can be arranged for. Ere long, it may be too late, if the work is not attacked with energy, and with a view to realizing future benefit by a present diplomatic and practical policy. Gas is wanted; others pretend that they can fill its place. Proof is not wanting that they cannot; but their argument is not without its seductive side when placed before a layman. And they will spend in order to get a footing. Never will the same opportunity arise for the gas industry doing a similar piece of work which will break open the way to new expansion. It is creative work; and it is worth something to obtain it. At the same time, it is not inseparable from the work that is being done the other end—to realize from the raw material used in producing gas the heating value for distribution to the maximum extent that good and economical service will ratify.

It may be added that the report of the Local Government Board issued at the end of last week indicates the immense importance of the subject to the gas industry. The total of the new housing site schemes now number 986. In 878 of these, the areas have been specified; and they aggregate 12,663 acres.

Cost Rises and Production Developments.

If there was one thing that was more striking than others in the proceedings at the meeting of the Eastern Counties Gas Managers' Association at historic Bury St. Edmunds last Thursday, it was the prominence that was given to the fact that the responsible officials of gas undertakings—large and small—have now to consider above all things the future in respect of existing actualities in relation to costs and present manufacturing developments. The two are strongly bonded together. The matter is found streaming through the Presidential Address of Mr. H. R. Wimhurst, which was full of independent thought upon questions that surround the gas man in these days of mutable conditions. It had accentuation in the paper which Mr. W. W. Townsend, of Colchester, contributed, which described skilful work that has been done under very adverse works' and other conditions, with water-gas plant at Colchester, and which has had the effect of assisting to stabilize the position of his Company in these days of war adversity, to reduce the average cost of production, and to maintain the price of gas at a moderate point for the consumers.

The fact lays heavily upon the mind that the costs of materials and labour are both seriously higher—upwards of 100 p.ct. higher on the average; and, surveying the situation (as the President points out), we have to keep well in consideration the unpleasant fact that it is not likely that there will be any easing of the conditions in these respects for several years to come. Indeed, there is nothing visible which warrants any hope that pre-war prices will ever again be touched. The upheaval and the consequences have been too great, and have brought about too vast a revolution in human ideas, needs, and demands, to permit even the harbouring of the thought that the old economic conditions will ever be re-established; and we should not wish them to be in their entirety. The gas industry have no direct control over these changes; and it therefore devolves upon the administrative and executive men of the industry to ascertain how they can mitigate the issues of new cost conditions, with the view to embracing their gas-trading opportunities, by bringing to bear those material influences which come more immediately within their province and control—such as gas-manufacturing developments, and the production of more efficient gas-consuming appliances. They have also justice on their side in pressing for a revision of the financial provisions in the industry's statutes to which form was given on basic conditions that have of late been altogether swept out of existence. Another matter in which the gas industry, although without determining power, should be heard is on the question of coal supplies and prices. Its position as a consumer, and one that makes better use of the raw material than any other, justifies the claim to be heard. Mr. Wimhurst suggests that there should be a sliding-scale arrangement to regulate and vary owners' profits and miners' wages inversely to the rise and the fall in the price of coal at the pit-head. This is not an original idea. But it is one that should be brought before the Coal Commission; and perhaps Sir Arthur Duckham will see that it is introduced to the notice of his colleagues. It is easy enough, however, to suggest; more difficult to apply. The application would be somewhat difficult in respect of those mines from which

different classes of coal are raised; and more especially as the President suggests that the value of the different classes of coal should be settled for gas making according to the percentage of volatile matter and fixed carbon they contain, and for other purposes on calorific value, with further variations where the ash content exceeds 5 p.ct.

The offsets to the new conditions within the gas industry are by the aids of all economy producing machinery, and the use of methods of gas production which will raise the output per ton of material employed. The President rather leans to a universal standard quality of gas, though admitting the difficulties owing to the varying classes of material available in different localities, and to the variation as between one locality and another of the predominant use to which gas is put. His chief consideration in favour of a standard gas appears to be that the manufacturers of apparatus would operate on much firmer ground, and be able to standardize their goods. The limitations to a universal standardization of gas have been recognized in their report by the Board of Fuel Research; and fortunately the members of the Board appreciate, like the manufacturers of gas appliances, that a preferable thing would be to have all apparatus (which can be standardized) fitted with efficient means of air and gas regulation, which can deal with gas of differing qualities. That is the rational procedure in the circumstance of local economy in gas manufacture being a consideration that should not be neglected. Variations in coal, variations in plant, and variations in the methods that will give the best results from different coals, are all factors that protest against any universal standardization of the gas itself. Standardization means an uneconomic limitation in the fields of plant, coal supply, and manufacturing methods. No other evidence of this is needed than the testimony, drawn from different circumstances, submitted in the discussion on Mr. Townsend's paper. However, the President recognizes that we have in charge-steaming and water-gas plants methods of economy applicable to gas-works of all sizes, if a pressure of 30-10ths is given at consumers' appliances. This is rather high as a minimum in all circumstances; and the Board of Fuel Research are quite satisfied with a minimum of 20-10ths at the outlet of the consumers' meters, though suggesting that, at the initial stage of the revolution in gas supply, the selected—selected by the supplying undertaking, subject to the adoption of the heat unit basis of charge—calorific value should be somewhere between 400 and 500 B.Th.U. However, there is no question to-day that it is by dilution of well-made coal gas with well-made water gas produced separately or as part of the retort process that a good portion at any rate of economy in gas production is to be obtained.

It is clear that Mr. Wimhurst is not altogether in favour of selling gas on the basis of heat energy, on which matter the logic of his position is not very strong considered in relation to the report of the Board of Fuel Research. In the first place, be it noted, from a little table in the address, how his day load has swung over to the position of being greater than the night load. This tells a tale of the utilization of gas for its heat energy; and we undertake to say that not an insignificant part of the night load is also consumed for purposes other than lighting. This being so, heat energy appeals to us more than the cubic feet of something which is not very strictly defined by the term "gas." Between the laudable suggestion as to sale on the heat energy basis and practical application, Mr. Wimhurst finds the consumer's meter, which would still register in volume. That is the only tangible reason we can discover for his preference to retain the volumetric basis of charge, though he makes concession to the extent of thinking the charge per 1000 c.ft. or 100 c.ft. might well vary according to the average calorific value of the gas supplied in a quarter. The complication this would introduce would be worse for a consumer, because he would wonder why—and it would be difficult to make him understand why—his charge varied per 1000 or 100 c.ft. every quarter. But the whole of the argument in favour of the retention of volume as against heat energy as the basis of charging for gas, is destroyed by the one simple fact that the heat energy basis is the only way found by the Fuel Research Board of escape for the industry from a fixed standard of quality. It is the only way to greater freedom. The report of the Board is well worth reconsideration from this point of view. Then perhaps the President will revise his views in this regard. Otherwise we can only speak well of the address; and the one point of difference is really a matter of opinion.

Economies in Water-Gas Manufacture.

To the question of the part that water gas takes in the economies of gas manufacture, and to its economical production, the paper of Mr. Townsend (referred to in the preceding article) was directed. Blue water gas has established itself more firmly during the war than it had ever done previously; and its economy is going to make a considerable difference to the gas industry just when it is wanted, with coal at the prices now obtaining, and those that our most sanguine expectations will permit us to contemplate as likely to rule in the future. At the same time, there is satisfaction in the knowledge that the price of oil has declined, and will probably make further progress in like direction; so that, by a slight amount of carburetting, the ability will be increased to enlarge the proportion of water gas that can be added to coal gas, which can also as a consequence be increased in quantity per ton of coal carbonized. Quite moderate carburetting will also eliminate the menaces of sulphur dioxide, though there are other means of doing this—such as mixing the blue water gas with the coal gas before the scrubbers, where the ammonia will neutralize the sulphur dioxide. The carburetting will also do something to minimize the nuisance from naphthalene where benzol recovery is practised. Moreover, the ability to slightly carburet has the further advantage of enabling sharp variations to be made (without causing annoyance to consumers) in the proportion of water gas to meet sudden flights in demand. However, these are not the matters that constituted the chief object of Mr. Townsend's paper. It was to show the advantages of scientific control of water-gas plant over the old more or less uncontrolled methods of working, which, however excellent and conscientious the attendants, are not such that there is constant maintenance of the plant at concert pitch. Mr. Townsend has introduced steam and air meters and pyrometers; and those who study what he says towards the end of the paper as to the calorific balance, as well as the tabulated figures, will see that he is, helped by the disclosures of, and regulation by, his adjuncts, doing exceedingly well from the plant, though the economy possibilities, he indicates, are not by any means exhausted by what he has done. But in considering the results quoted in the paper, readers must remember that this is not a new up-to-date water-gas plant, but merely a reconstructed one. Hence there is greater value in the contribution, as there are a large number of water-gas plants that are not new, and the working results of which are not what they might be by a scientific determination of the methods of operation, and by subsequent control, according to the prevailing conditions.

From the mixed gas output point of view, Mr. Townsend is not accomplishing so much as he will be able to do when released (as he hopes to be before long) from the confinement imposed by old-fashioned hand-fired retorts, which were a legacy not altogether to his liking. He only makes with the present carbonizing plant 10,700 c.ft. per ton of coal; but being able to add to the good quality coal gas 4500 c.ft. of blue water gas, he has for sale 15,200 c.ft. of gas per ton of coal carbonized, with, it follows, a reduced quantity of coke, for sale. Of course, there are alternative methods of working, as Mr. Frank Prentice pointed out in the discussion; and he thought that Mr. Townsend would be making a good bargain if, instead of manufacturing a rich coal gas, he increased the production to 13,000 or 14,000 c.ft., and, by using a gallon of oil and 5000 c.ft. of water gas, raised this to a total of 19,000 c.ft. of mixed gas. Probably Mr. Townsend would if his plant would let him; and probably he will when his new horizontal retorts are at work. Methods are largely controlled by plant conditions. However, by what he is doing—despite plant conditions, low coal gas make, geographical situation, and every adverse war condition thrown into the account—he is sending out coal gas to-day into his holders at 2s. 3d. per 1000 c.ft. and making water gas for 9·86d. So the mixed gas costs him some 5d. per 1000 c.ft. less than the holder cost of the coal gas alone. The calorific value of the 15,200 c.ft. of mixed gas is 7,600,000 B.Th.U. This is a very good figure in the circumstances; it is not a figure per ton of coal used with which Mr. Townsend or any other progressive gas man will hereafter be content. But when one is tethered by plant conditions, no matter how great ambitions may be, there is a point which cannot be exceeded. However with the mixed gas, sulphur, naphthalene, and inerts are less, and with the coal gas working the tar and sulphate of ammonia returns are improved. There was in the paper and through-

out the discussion—especially in the remarks of Mr. Sumner, Mr. Tully, and Mr. Moore—assurances as to the satisfaction of the consumers (as measused by the number of complaints received) with gas of lower calorific quality than hitherto supplied, and the satisfaction appears to increase the larger the percentage of combustibles in the gas.

When there is steaming of charges or water gas is made in separate generators, some people object to the volume of mixed gas being quoted as gas made per ton of coal. The coke and breeze used in the generator and for steam-raising in making water gas may range, according to circumstances, from 40 to 60 lbs. per 1000 c.ft., so that there is a material reduction in the quantity of coke remaining for sale. But as the coke used is only a proportion of the coke made per ton of coal, and gas is brought into account instead of coke, we cannot see that there is much, if any, valid objection to the use of the term "per ton of coal," if all writers and speakers would, in addition to gas, mention the quantity of coke they have for sale per ton of coal used.

Consolidated Subscriptions.

The Chairman of the Reading Gas Company (Mr. G. W. Webb), in his remarks in welcoming the members of the District Conference of the British Commercial Gas Association, made certain suggestions for the consideration of the various organizations of the industry. Among them he favours a consolidated subscription which should cover all the co-operative work of the industry, instead of (say) one subscription to the National Gas Council, another to the British Commercial Gas Association, another to the Gas Companies' Protection Association, and others for sulphate and benzol purposes. We can see the matter from his point of view; but a lump subscription embracing all co-operative work might look much bigger in the eyes of some gas administrators than separate subscriptions for different purposes. With separate subscriptions for defined objects, they know exactly the use to which the money is to be put; and the charge can be made in the correct place in the outgoings of the undertaking. It is all money usefully spent; and we are not satisfied it would be a politic thing to consolidate the subscriptions, unless the application form for the one subscription set out item by item the purposes to which the money was to be devoted.

Sales Organization.

The British Commercial Gas Association have constructed a system of sales organization in which, on presumably new lines, a card index record is introduced. The theoretical considerations upon which it is based were stated by Mr. F. H. Holland (who is looking after this particular part of the Association's activities), in a paper that he read at the Reading conference, as reported in later columns of this issue of the "Journal." Systematic organization of the developing and protective work of the sales department of a gas undertaking is essential; but all such systems want combined with them ability and enthusiasm on the part of the gas manager and the members of the sales department. The ability is quite beyond the power of the Association to implant, though they may create enthusiasm. However, even if there is not the personal qualification, every gas undertaking will be all the better equipped by doing (if not already doing them) those things which, in the considered judgment of those who have been making a study of this matter, should be done. Though Mr. Holland disclosed the foundation upon which he has been working, the details of the system are a matter for a personal interview, which can be obtained by communicating with the Secretary of the Association (Mr. W. M. Mason).

The New "Eagle" Gas-Range.

There was a sample of this range on view at the Reading Gas Company's show-room last week; and some of the gas men there for the "B.C.G.A." conference took the opportunity of inspecting it. There was general approval of the changes made on the hot-plate, which secure greater efficiency and better service in this important part of a cooker. That this would be so was clear from the description given in our columns last Tuesday. The raising of the oven from the floor was also a feature which commends itself, as was the useful drop door to the oven. There were three criticisms made by the visitors which all concern the oven; and we will give the makers the opportunity of dealing with them. The solid bottom of the oven is removable; the burner (which can also be taken out for cleaning) is situated underneath; and there is a slide in the solid bottom for lighting the burner. The first criticism is that the slide may be left open, and the flames come through. This is not a very serious objection. The second is that with the jets hidden away, without any visible indication of them being alight, the burner may, through carelessness or haste, be left on, and waste of gas take place. We are afraid this also applies to visible flames. The third criticism is the most important. It is that, the oven being somewhat shallow through the presence of the solid bottom, it will be necessary, when baking a fair-sized joint, to have a pan on the hot solid bottom, or in close proximity to it, to catch the dripping. What is going to happen to the dripping? Is there any danger of boiling, evaporation, or burning? If there is any good ground for these criticisms and questions from first observation, they may as well be dealt with initially as later on. No doubt the makers have a good reply; and, if so, we shall be pleased to hear it. For the rest, there was nothing but praise for a successful effort at improving the gas-cooker; and the greatest improvement has taken place just where it was most required.

Small Works and Labour.

Consideration might be given by the National Gas Council to a suggestion that fell from Mr. H. R. Wimhurst in his Presidential Address last Thursday to the Eastern Counties Gas Managers' Association. The increase in labour costs has fallen heavily upon all gas undertakings, already much overburdened from the fact that their raw material is coal. But the cost of labour is a matter of considerable gravity to the smallest works; and more than once during the proceedings at the meeting, we heard of these little struggling concerns being "on the rocks" through the adversities of the past few years. Mr. Wimhurst's suggestion is that the smallest works should be exempted from the operation of the eight-hour day. Can this relief be arranged for by the Council?

Fuel and Lighting Rationing.

There were newspaper reports last week that there was about to be abolition of control over gas and electricity. We hope this is true; but the report is premature. The fact of the matter is that the Coal Controller's Department are now considering the question, with the view to bringing about modifications on July 1. There is practically a promise that, if there is no abolition of control over gas and electricity, larger rations will be allowed, and there will be fewer forms to be filled in. For small mercies we shall be truly thankful, while strongly preferring complete liberty. The Household Fuel and Lighting Rationing Order must not (as has been the case in some quarters) be confused with the Lighting, Heating, and Power Order, which preceded it, and which has been cancelled.

Varying Prices of Benzol.

The Motoring Correspondent of the "Daily Telegraph" has been directing the attention of his readers to the varying prices charged for benzol. Competition by the gas companies and others who have been making benzol during the war, and now offer it to motorists for transport purposes, will, he says, be insufficient to reduce the price of petrol. Motorists have been supplied with lists of depôts in Great Britain and Ireland where this substitute for petrol can be obtained. "Its price seems to vary considerably, as while South Wales appears to offer benzol at 2s. 4d. per gallon in bulk, London charges 2s. 7d. per gallon. In the Metropolis, too, there is no standard, as while one pays 5s. per two-gallon tin south of the Thames, the price is 6s. north of this boundary. At 6s. per two-gallon tin, the motorist is not offered sufficient inducement to use it in place of petrol at 6s. 3d. for the same quantity. Consequently, many owners of motor-cars are using a mixture of the two as a compromise."

Benzol and Encouragement by the Government.

Talking of the prices of benzol, reminds of the references to it of the Chancellor of the Exchequer in his Budget speech in the House last week. The super-tax of 6d. on motor spirit is to go; but for the time being the 6d. per gallon import duty still stands. It is clear that the Government are looking favourably upon the continued production of benzol in the national interests; and they

will continue to do so if guided by the report of the Board of Fuel Research, and if they carefully consider all the facts of the matter —particularly as it affects the gas industry. The words used by Mr. Chamberlain are encouraging. Here, he said, "we have the case of an industry found vital during the war, created and stimulated for war purposes, practically created at the Government's instigation, and under Government guidance, which industry is threatened with the loss of its market owing to the cessation of war. That is not all. Benzol is not only important to the nation as an additional indigenous source of supply of motor fuel, but it is a very important ingredient in dyeing—an industry the growth and establishment of which in this country we have done everything to promote. Under the circumstances, and acting on the advice of the Board of Trade, I propose to give legal authority to the exemption of benzol from taxation."

REGULATION OF COAL AND COKE STOCKS.

WE understand, though we have not received official notification on the point, that an instruction has gone out to the Fuel Overseers that they are not to divert for household purposes coal required for industrial uses. If, therefore, gas managers have any trouble in this respect, they would do well to get into communication immediately with the Divisional Officers, so as to ascertain whether or not this information is confirmed by their instructions.

Meanwhile, the National Gas Council have been officially notified by the Controller of Coal Mines Department that as from the 1st. inst. the instruction issued to gas undertakings that one week's winter make of coke should be held in stock is cancelled. Gas engineers are now at liberty to retain or dispose of stocks as they may think fit.

JOINT INDUSTRIAL COUNCIL FOR THE GAS INDUSTRY.

The First Meeting of the "Joint Industrial Council for the Gas Industry" was held at the Ministry of Labour, Montagu House, Whitehall, S.W., on Wednesday last.

Mr. WARDLE, M.P., the Parliamentary Secretary to the Ministry of Labour, welcomed the members of the Council, and reminded them that this was the thirty-second Joint Industrial Council under the Whitley scheme and the third Joint Industrial Council which had been established, in which local government authorities as well as company-owned undertakings were concerned. The Council were, he said, to be congratulated that the preliminary proceedings had been concluded in so short a time. The Government were setting-up the machinery as far as possible, and then proposed to look to the industries concerned to get together to solve the various problems which would arise and to be as much as possible self-governing. He pointed out that there was an outside factor which must not be overlooked—viz., the general public of the country, whose servants they were and should be. He wished the Council long and happy experience.

Mr. D. MILNE WATSON, speaking on behalf of the employers, said he felt a considerable amount of pride that this Industrial Council had been organized in record time. He had always found that, when employees and employers came to close quarters, they very soon understood one another. He most heartily endorsed the remarks of Mr. Wardle with regard to the work of the officials in the Ministry of Labour, who had rendered splendid service. He recalled the name of the late Mr. St. George Heath in connection with the early stages of the negotiations, and thought that gentleman would have been very proud had he lived until the present time. Mr. Heath's premature decease was deeply regretted. Mr. Watson also expressed very high appreciation of the work of Mr. Cummings and Mr. M'Gegan. He heartily concurred with Mr. Wardle that the Council would be a great step in advance. He proposed a very hearty vote of thanks to Mr. Wardle for his address.

Lieut.-Col. WILL THORNE, M.P., as one of the oldest gas-workers in the room (having commenced service in 1874, at the age of eighteen, with the Birmingham Gas Department, in the days of the late Mr. Joseph Chamberlain), said he believed a great deal of good could be done by, and very valuable suggestions would come from, the Joint Industrial Council to benefit both sides. He hoped the Council would go on in a friendly spirit, and he was very pleased to know that the Chairman recognized that matters had been speeded-up and no time had been lost. He believed the Council would be the means of preventing troubles. He had great pleasure in seconding the vote of thanks moved by Mr. Milne Watson.

The vote was carried unanimously.

Lieut.-Col. THORNE said that his trade union colleagues on the Council had had a preliminary discussion, and had come to the unanimous conclusion that Mr. Milne Watson should be proposed as Chairman of the Council. He thought Mr. Milne Watson would do justice to both sides.

Mr. SIMPSON had great pleasure in seconding the nomination. His experience was that Mr. Milne Watson was a very fair-minded man.

The proposal was put and carried unanimously.

Mr. Alderman PHILLIPS said it was his pleasant duty to nominate Lieut.-Col. Will Thorne, M.P., as Vice-Chairman. He hoped that the meetings would bind both sides closely together for the well-being of the industry. It was a very great step in advance if it was to be the beginning of an era of industrial peace. He was sure that no better Vice-Chairman could be proposed than Mr. Thorne.

The nomination was seconded by Mr. MILNE WATSON and carried unanimously.

Mr. W. J. Smith (National Gas Council) and Mr. Arthur Mayday, J.P., M.P. (National Union of General Workers) were appointed Joint Secretaries.

The Council then proceeded to deal with the business on the agenda.

PERSONAL.

In connection with the half-yearly meeting of the Metropolitan Gas Company of Melbourne, which is reported on another page of this issue, it is of interest to note that Mr. J. N. REESON, M.Inst.C.E., who in 1913 was appointed Engineer to the undertaking, in succession to Mr. P. C. Holmes Hunt, is now in this country on six months' leave of absence, prior to commencing another five years' term of office.

Mr. S. CARPENTER, owing unfortunately to health considerations, has felt compelled to resign the position of Engineer and Manager of the Cromer Gas Company. At the annual meeting of the Company, the Chairman (Mr. E. L. Burton) announced this decision with regret; and he added that they would all wish Mr. Carpenter years of good health and happiness, wherever he might go. Mr. Carpenter had produced excellent results, which he did not think would easily be surpassed; and he offered his congratulations to him upon this.

Mr. FRANK ERNEST COX has been appointed Engineer and Manager to the Newport (Isle of Wight) Gas Company, in succession to Mr. S. W. Ibbotson, who resigns the position on June 30. Mr. Cox was trained under Mr. S. O. Stephenson, of the Worthing Gas Light Company, and was subsequently engaged as Assistant there for two years. He relinquished this post to take up the appointment of Chief Assistant in the Gas Department of the County Borough of West Bromwich, which he has held for the past six-and-a-half years. There were 104 applicants for the post.

The Glasgow Corporation Gas Committee met last Friday week to consider the appointment of a chemist to superintend the working-up of the tar, ammoniacal liquor, &c., in the chemical works attached to the various Corporation gas-works The Committee unanimously agreed to recommend the appointment of Mr. W. A. WALMSLEY, of Stockport, at a salary of £650, rising by annual increments of £50 to £800 per annum. Mr. Walmsley is 30 years of age, and graduated B.Sc. (Hons. Chem.) at Manchester University in 1910. For some two years he was Assistant Manager to the West Cumberland Bye-Products Company, near Maryport. But for the last six years he has been Manager of the Clayton works of Messrs. Hardman and Holden, Ltd., of Manchester.

The successor to Mr. John Terrace as Engineer and Manager of the Great Grimsby Gas Company is Mr. WILLIAM BAILLIE, who is at present Engineer and Manager to the Keighley Corporation Gas Department. Mr. Baillie was educated at the Middlesbrough High School and the Glasgow Technical College. His engineering apprenticeship was served with Messrs. Sir William Arrol and Co., Ltd., of Glasgow, and afforded him experience in structural erection, stoking machinery, and coal-handling plants at various large gas-works. For two years he was Assistant to Mr. J. H. Brearley, of Longwood, and then for three years was Manager of the Penistone Gas Company. Then, in 1906, he became Assistant Engineer and Manager to the Keighley Corporation, under Mr. John Laycock, and upon Mr. Laycock's retirement ten years ago Mr. Baillie was appointed their Engineer and Manager. During the latter period important reconstructions and additions have been carried out, including a new holder and a 2¾ million c.ft. carbonizing plant of horizontal tens. In 1914 the price of gas was 1s. 11d. per 1000 c.ft.; the present charge being 2s. 11d. There were 101 applicants for the Great Grimsby appointment. Mr. Baillie's loss to the town will be much felt, because he has made the gas-works the most remunerative of all the municipal departments; and despite the difficulties of war time, he has maintained excellent working results.

In the course of the proceedings at the last meeting of the Lancashire Commercial Section of the Manchester District Institution of Gas Engineers, the Chairman (Mr. H. Kendrick, of Stretford) said that the Committee having considered it desirable to mark their appreciation of the work for the section done by Mr. JOSEPH M'NICHOLL, the retiring Hon. Secretary and Treasurer, the members had been circularized, and readily agreed to the suggestion. The matter had been left in the hands of Mr. S. Meunier and himself; and they had purchased an English cut-glass vase. In making the presentation, Mr. Kendrick asked Mr. M'Nicholl to accept the gift as a small token of esteem and appreciation of

the good work so willingly done by him for the section, with the hope that he would have a successful time in his new sphere of action, and that the present would remind him of old friends in Lancashire. Mr. T. Duxbury, Mr. J. T. Broughton, and Mr. J. E. Blundell also spoke in eulogistic terms of the services rendered by the late Secretary; and letters of appreciation were read from Messrs. W. Whatmough, J. W. M'Lusky, F. Betley, Samuel Glover, and G. S. Frith. Mr. M'Nicholl thanked Mr. Kendrick and the other gentlemen who had referred so kindly to his services, and the meeting for its hearty reception of the vote of thanks. He was unaware that he would be asked to accept such a handsome present as a token of their goodwill. It came as a very pleasant surprise; and he would treasure it as long as he lived as a memento of his many friends in the Manchester district. Valuable though the present was, he valued still more the kindly feeling which had prompted the giving of it. When asked to take up the duties of the office, he felt very diffident about it. Mr. Halliwell, the late Secretary, had set up a very high standard—a standard which he felt he could not attain; but he had made up his mind to do his best, and it was very gratifying to find that his efforts had been appreciated.

In view of the removal of Mr. Joseph M'Nicholl from Mossley to Cork, it has been necessary to appoint a successor to him in the position of Hon. Secretary and Treasurer of the Lancashire Commercial Section of the Manchester District Institution of Gas Engineers. After fully considering the matter, the Committee approached Mr. Robert B. Braddock, of Radcliffe, who expressed his willingness to undertake the duties, if asked to do so. At the last meeting of the section, Mr. Braddock was unanimously appointed.

STUDYING THE FACTORS INVOLVED IN THE MANUFACTURE OF CARBURETTED WATER GAS.

In a lengthy paper presented at the recent annual meeting of the Illinois Gas Association, Mr. R. B. Harper attacked, on new and original lines, the question, "What are the factors involved in the manufacture of carburetted water gas?" He said that the answer was far more complicated than might be supposed, as so many factors affecting the result in variable degrees, that might be difficult to ascertain or estimate, were concerned; and it was hardly possible to attribute some end-result to any one factor that at first sight might appear to be the cause. Only by study of the complex problem in a complete and systematic manner, could one hope to reach the true causes, and develop control methods that would ensure economical and reliable production of any desired results.

The chief considerations are concentration or mass-action, temperature, and time. These are subject to considerable, and for the most part continuous, variation; so all factors connected with them are also liable to fluctuate, and lead to undesirable results if not kept within reasonable bounds. He grouped the factors under headings: Rates and amounts of input and output, amounts present at any given time, intimacy of contact, free spaces, surfaces, distributions, mechanical structure, chemical composition, pressures, times of input, output, and contact, temperatures of input and output at any given time, heat absorbed or generated, and quantity of heat at any given time—with six to twenty items under each head, and a total of 289.

He quoted several illustrations, to show that any one factor selected at random was dependent on, or influenced by, several others. The first item likely to attract attention was the rate of production, which obviously depended upon both the make of "blue" and of oil gas, time, and temperature; and full inquiry would show that it was more or less influenced by all the other items. Under the heading of "time," the let-down periods for cleaning or repair must be considered; also the time occupied in clinkering and cleaning the cupola, which in turn depended upon the quality of the fuel used. A distinction was drawn between the light dust that was carried forward by the current of gases, and the solid clinker left behind in the cupola. The importance of avoiding excess of steam, and of an ample pressure on the air-blast, was mentioned. Errors in these items might influence the working to the extent of 20 p.ct.

After discussing several other factors, and interpolating many valuable hints on the working of a cupola plant, he pointed out that the greatest capacity, and the most efficient use of the raw material, could not be attained without full control of all the factors mentioned. Otherwise it was simply a case of groping in the dark for solutions of difficulties, with but the most remote possibility of success based on guesses and haphazard, and at the best, very slow progress towards the best results.

British Commercial Gas Association Conferences.—In addition to the business conferences of the British Commercial Gas Association at Reading and Sunderland, reported in this issue, the following further list of conferences has so far been arranged: Cardiff, May 7; Derby, May 9; Blackpool, May 16; Bristol, May 20; and Edinburgh, June 13. There will probably also be conferences in Cambridge and Leeds; but the dates for these have not yet been decided upon.

ELECTRICITY SUPPLY MEMORANDA.

The "Electrical Correspondent" of the "Times Engineering Supplement" has published an article on "Public Interest in Electricity." There has been an attempt of late to apply plentifully and wide afield the art of intensified cultivation to that interest through newspaper articles mainly founded on Departmental reports which promise so much, but in which there is no trace of the compilers having been fatigued by providing precise information as to how the promise is to be fulfilled. Whether or not there is to be fulfilment is to come by demonstration, which is likely to occupy an unknown number of years. However, the "Times" "Electrical Correspondent" has a headpiece of his own, and is not (reading the lines and between the lines of his article) one of those who is deceived by what has appeared in the way of popular articles, inspired officially or by interested parties. For the public, electrical application is not going to develop as if by magic. It will take time; and there are physical and financial obstacles. The correspondent does not quote among the physical obstacles the low thermal efficiency of electricity generation at its best, nor among the financial ones the much lower price at which B.Th.U. are supplied by other agents—gas, for example. Nor, again, does he mention that the efficiency of gas appliances is being largely improved by their manufacturers; while the report of the Board of Fuel Research came too late for him to note the open door which they propose should be offered to the gas industry for increasing its capacity in supplying economical heat energy, and charging for it on a heat-unit basis. The omission from the article of these particulars (about which information is to be found in our last week's issue) does not detract from the interest in what the "Electrical Correspondent" has to say.

Electrical Development.

The Trading Position Examined.

That the British Government has at length discovered electricity, and that slowly and "with some signs of pain," the Electrical Development Association has been brought to life, are events which have a timely connection. But the "Electrical Correspondent" urges that, "if in this case we are to witness the unfolding growth of an industry still in the budding stage," it is as well there should be no false estimates of the speed that may be at once obtained. This is a very opportune warning. He believes the demand for electricity can be stimulated by thoughtful publicity and popular instruction. And "thoughtful publicity" and "popular instruction" will not be a monopoly of electricity. Gas will also announce its virtues and economies for all the cooking and heating necessities of a household, from the full range of which electricity knows itself to be on economical grounds hopelessly excluded. Our friend is sagacious enough to realize that, despite "thoughtful publicity" and "popular instruction," all that can be reasonably expected is that the electrical public must consist mainly of people who can afford the initial cost of installation, and who happen to live in a neighbourhood favoured with a low and adaptable tariff for current. Here again the "low and adaptable tariff for current" will depend upon the price at which, if the national scheme matures, the generators for the area can deliver; and when generation is conducted for at one end of the scale dense industrial areas and at the other end for sparsely populated rural areas, probably distant from the generating centre, someone has to pay for the differences in cost that are entailed. In all likelihood, the richer electricity consuming territory will have indirectly to pay something towards the cost of supplying the poorer district. The costs of delivery under the new conditions are among the at present unknown quantities which cluster about these schemes, and defy any definite calculation. The retail departments are to be kept, according to current plans, in the hands of the present suppliers. The companies will want their dividends, whatever may be the cost of the energy delivered; and the municipalities will probably want balances (if they can get them) to utilize, as they in their wisdom think fit, for purposes altogether external to electricity supply. The glamour of profits has done more than anything else to stimulate municipal ownership of electricity undertakings, with not altogether satisfactory results in more ways than one, as electricity consumers in some places and ratepayers in others know to their cost. When the municipal electricity department becomes merely an electrical shopkeeper, perhaps with surplus profits limited, and with no generating plant at its back, the question is whether there will be the same stimulus as before, or whether interest will wane, especially if it is found that the electricity delivered in bulk is no cheaper than, if as cheap as, their municipally controlled stations could formerly supply at. However, the Electrical Development Association will find plenty of work under the new order of things, if general support and inspiration are rendered to it. Other points made by the correspondent are that the country's manufacturing capacity for electrical appliances is greater than before the war, and that there should be no difficulty in raising capital. He does not mention the fact that capital will be dearer for buying articles the material and labour expended in the production of which will be more costly. But we think he has this in mind, for he plays upon the hire-purchase key.

Another Correspondent and Prices and Efficiencies.

We have another "Engineering Correspondent," writing in the "Daily Telegraph" under the title of "Heating and Cooking by Electricity," and looking very hopefully to electricity taking a much larger place in the field of heating. In view of the fact that he is writing in a popular paper, it is a pity he did not first satisfy himself as to the validity of his premises before drawing deductions. At the same time, he tries to be guarded, as he is just as incapable as any other human being of penetrating the future. We see this in the opening of his article: "The high tariffs," he writes, "which are the most serious obstacles to more rapid extension *may be* reduced as industrial conditions become more stable; and the efficiency and convenience of electrical apparatus will then begin to impress hesitating consumers." The "may be" clearly exhibits caution. Even with the efficiency predicted for super-generating stations, discounted by the higher costs of money and materials, and the expenses of large and far-reaching distribution systems, the road appears to many competent electrical men a long one to any appreciable diminution of costs at the point of use. It would be highly interesting to know what "Engineering Correspondent" can say precisely, of his own knowledge, about the efficiency of electrical appliances. The properly made electric-heater does not offer very much scope for improved efficiency; and when one considers how relatively small is the proportion of fuel costs in the total costs of electricity delivered, how badly electric-heaters come out in relation to the original heat in the coal used away back at the generating station, how costly they are for continuous use, how frequently they are displaced by gas-fires, together with the fact that any extensive use of them is in the winter time only (which provides considerations covering capital, maintenance, and many other things that call the responsible electrical engineer to attention), it is not so very easy to see that the outlook for electric heating can brighten considerably. As to cooking and water heating, the oven would represent only a small part of the use of electricity; the hot-plates the major use. The "efficiency" of electric hot-plates is well worth studying by "Engineering Correspondent," and the continuity of pristine efficiency is a matter that should clearly not be neglected. Time is also a factor in household economy, as it is in heat losses. And we suggest to him that a comparison of the prospects of gas making putting more B.Th.U. in gas-mains per ton of coal, together with the fresh successes of the manufacturers of gas appliances might give some food for reflection. To say that, "given a reasonable low cost per unit, electricity can compare very favourably with any other means of cooking," does not accord with fact. The recent tests which the British Commercial Gas Association had with a maker of electrical apparatus confirms this; and so do the experiences of many householders who have yielded to certain seductive representations. The invitation of the "B.C.G.A." to trials covering all cooking and kitchen work has not been accepted by the electrical industry. And perhaps it will have less reason now for doing so in view of the new types of gas-cookers that are appearing on the market. As to utensils, with the electric hot-plates combined with them, how many ordinary householders can afford such things? However, we suggest to "Engineering Correspondent" that he should show his faith by entering into a demonstration with the "B.C.G.A." so as to establish the truth of this declaration: "Where a large amount of cooking is needed, with care and economy the cost need not largely exceed that of cooking by gas. So far as cooking on a large scale is concerned, there can be no doubt whatever of the superiority of electric cooking." If "no doubt" exists, he should be quite safe in arranging to participate in a demonstration to justify this and other assertions.

Production Efficiencies.

The same "Engineering Correspondent" does not appear to be particularly well informed on gas-works efficiencies; otherwise he would have done better than make this comparison from the paper recently read before the Royal Society of Arts by Sir Dugald Clerk: "Over 46 p.ct. of the original heat of the coal consumed in gas-works is obtainable from the bye-products—coke and tar—while the quantity of heat which can be produced by electricity is only 8·5 p.ct. of the original heat of the coal consumed in its production." There he has omitted part of Sir Dugald's statement, with the result that he has compared the total heat efficiency of the electrical process with the heat efficiency as represented by coke and tar only—thus entirely neglecting the not unimportant factor of gas Now let us see exactly what Sir Dugald said:

> The process is economical, as the average thermal efficiency of carbonization is approximately 71 p.ct. That is, after the completion of the process, the three main products—viz., coal gas, coke, and tar—are capable of evolving, on complete combustion, 71 p.ct. of the original total heat of the coal. Of this, 25 p.ct. is obtainable from coal gas, and 46 p.ct. from the coke and the tar. If we consider the whole of the heat used in the process (amounting to 29 p.ct.) to be debited against the principal product—coal gas—then, to obtain 25 heat units in the form of gas, it is necessary to use a total of 25 + 29 = 54 heat units of the original coal. That is, the thermal efficiency of the gas-making process is $\frac{25}{54} = 0{\cdot}46$, or 46 p.ct.

There we have a total efficiency of 71 p.ct. to set against the average 8·5 p.ct. of electricity generation. In his Cantor Lectures, Prof. Bone showed a heat-balance for the vertical-retort system of carbonizing by coal of 89 p.ct., and more by steaming the charges. It behoves "Engineering Correspondent" to put this matter right with his readers, and not to leave with them an error (let us say) of misconception.

The Voice of the Electrical Advocate.

We come across another interesting point in this article. "The electric radiative or convective apparatus has the advantage of portability. It can be placed in the most convenient position in a room for warming any particular part, or a suitable spot may be readily obtained by trial, so that the air in the room is completely warmed as rapidly as possible." "For warming any particular part!" Heat sent into a room does not stand still. It distributes itself by well-known laws. Of course, our friend knows all about this. Naturally the nearer one sits to a source of heat the warmer one gets; but one does not require to be warmed on one side and not on the other. The degree of temperature to which the air of any room rises (whatever the conditions of the particular room) has relation to the quantity of heat sent out from the source no matter its position; and for a given price the gas-fire can transfer to a room a greater amount of heat than the electric radiator, due to the cheaper production of B.Th.U. the gas way than the electrical way. "Engineering Correspondent" says by the electric radiator "the atmosphere is not vitiated." Nor is it by the modern gas-fire, which transmits to the room by one means or another at least 75 p.ct. of the heat generated by the combustion of the gas, and the part that passes away *viâ* the flue assists to ventilate the room, which our scientists and common-sense tell us is an advantage not to be despised. If "Engineering Correspondent" would like to discuss these matters further with us, we shall be pleased; but meantime perhaps he will take the trouble to compare the amount of heat given off to a room by gas and electricity at a given price. If he likes, he may take the common pre-war heating price of 1d. per unit of electricity and the fair average price of 2s. 6d. per 1000 c.ft. of gas, or 2d. per unit, and (say) 4s. for gas now—leaving out of all consideration the possible prices at which B.Th.U. will be supplied by improved gas making and electrical generation. The article discloses the usual line of arguments adopted by the electrical advocate; but in these times of constructive work, every writer in the public press should exercise care in hearing and intelligently considering all sides of such a question as this.

"Electric Homes for All."

The small consumer is coming in for more attention. The "Times Engineering Supplement" has an article on how to cheapen the cost of electrical installation for the poorer classes of house; and so has "Electrical Industries." The difficulties are many; and the cheapening can, it seems, only be done by descending from good class installation and condemning the tenants of the smaller houses to live with unsightly surface wiring, cheap fittings, exposed filaments, and an absence of the protecting devices which no contractor would dream of omitting from any better class houses. What is necessary for the one in respect of safety and sightliness should be as necessary (though less ornate the fittings) for the other. However, we have not the space to describe the various departures proposed from approved practice to effect cost reduction; but there are some passages in the opening of the "Electrical Industries" article which are rather striking for the admissions they make. It is confessed that the electric home for all is an ideal still far short of realization. Though politicians talk glibly of making new homes for England, and of popularizing electricity among the masses, not a glimmer of hope, we are told, comes through the maze of bureaucratic circumvention of any genuine effort to deal with the practical side of the problem. It is far easier to promise than to plan. But it is submitted that until obstructive regulations are swept away, and the installation cost problem is solved in the light of existing conditions, it is idle to picture the universal electrical home so far as the artizan classes are concerned. Unless electrical energy is brought within the range of actual use in the cottage and the artizan dwelling, the worker cannot, the writer says, except in restricted areas, enjoy its "manifold advantages." "Low cost of current may be ever so alluring; but the cost of installing the service is more often than not the deciding factor." Apparently the electricity industry has missed its opportunity by not thinking more profoundly about these things before the war, and taking the necessary action. If, however, costs of installation were then high, what about the new standards of costs which have been brought upon us by the war and the ambitions of the people to handle more of the monetary product of their labour? If they would not pay for electrical installation before the war, with the "advantage" of handing out more than they were then doing for light and heat, they will not do it now, when installation and electrical energy both cost more.

The article, "Gas for the Housing Schemes," contributed by the Richmond Gas Stove and Meter Company, Ltd., to our issue of March 4, has aroused considerable interest in this important subject; and, at the response of numerous gas undertakings, the authors have had it reprinted in pamphlet form, and copies are now available (on application to the Company) for distribution to members of gas committees, housing committees, and others interested in housing schemes.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Annual Meeting in Newcastle.

The Annual Meeting of the North of England Gas Managers' Association was held last Saturday afternoon at the Offices of the Newcastle and Gateshead Gas Company—Mr. Norman S. Cox, the President, in the chair.

The President, at the outset, made feeling allusion to the deaths of Mr. T. H. Duxbury, of South Shields, and Mr. G. Henderson, of the Redheugh Gas-Works. Mr. Duxbury, he said, took a lively interest in gas in all its departments; and the members deeply deplored his loss. Although they did not see Mr. Henderson quite so frequently, he also had the interests of gas very much at heart.

The Membership Roll.

The following new members and associates were elected:

Members.

Mr. James Edward Blundell, of Carlisle.
Mr. Arthur Ingram Seaton, of Harrogate.
Mr. Dugald Currie, of South Shields.
Mr. Horace Chamberlain, of Workington.

Associates.

Mr. Leonard Alfred Sayce, of Sunderland.
Mr. H. D. Lees, of Sunderland.
Mr. Harold Greig, of Sunderland.

The Accounts.

The Hon. Secretary (Mr. Herbert Lees) presented the statement of accounts, and remarked that the expenditure had exceeded the income to a considerable extent. The balance of expenditure over income was £45 3s. 7d. Fortunately, they had a capital account to fall back upon; but they could not draw upon it always. It had been decided that in future the "Transactions," which were issued to the members at a cost of 7s. 6d. per copy, could only be obtained at that price by members ordering beforehand. The price from the publishers was now 10s. 6d. The "Transactions" were hitherto issued free to members; but in order to get rid of the deficit, as from the present year it had been decided that the members should pay for them. Last year the "Transactions" cost £37 19s.

The statement was confirmed.

Mr. Jacques Abady (London) then delivered an address on

THE COMMERCIAL POSITION OF THE GAS INDUSTRY.

He said there were about 500 statutory gas companies in the United Kingdom, and 300 corporation or municipal undertakings, with a combined capital of 150 millions, which were making gas and coke and bye-products. In addition, there were about 800 smaller non-statutory companies. The amount of coal carbonized in gas-works was about 20 million tons. There were 8 million consumers; very nearly every householder being a consumer. The price of gas had been increased all over the country; and it was true to say that the increase was mainly due to the increase in the cost of coal. It was true that the cost of labour had gone up, and it was true that concomitant expenses had increased; but if they, as he had done, looked at the analyses of gas accounts for 1913 and those for the latest available year (1917), they would find that the increased receipts from residuals as between those years more than covered the increase in the cost of gas due to causes other than the increase in the price of coal. He could prove this by figures if anybody doubted the correctness of the statement. Gas undertakings were in this position—they had had to increase the price of gas because they had had to pay more for coal, due to circumstances over which they had no control.

Financial Hardships.

The point he wished to make was that, if they took gas undertakings which were working under a sliding-scale, whereby the dividend depended upon the price charged for gas to the ordinary consumer, it would be seen that because the price of gas had had to be increased, the dividends which the companies could distribute had been reduced. The cause of this had been entirely out of the control of the management of the undertakings; and it seemed to him that it was very unfair to penalize an industry, whether it was a maximum-price company or a municipal undertaking, because it prevented them from building-up reserves and made it difficult to find interest and amortization and relief of rates in the case of municipal undertakings. There was nothing very novel in this statement; but it was a point which he thought should be dealt with in public. When the gas undertakings had been to Parliament, they represented this state of affairs; and all Parliament did was to grant the statutory undertakings temporary increases of charge. In 1918, Parliament simply gave them the right to charge such prices, with the consent of the Government Department, as would enable them to distribute three-quarters of their pre-war dividend, according to the standard price, whichever was the lowest, until two years after the war. It seemed to him that if they went to Parliament again and asked for a reconsideration of the sliding-scale position, they would be met with the reply: "Oh, this has already been considered by a Parliamentary Committee, and the matter cannot yet be reopened." He therefore, having looked round the subject, ventured to make one or two alternative suggestions with respect to financial amelioration, which might be worthy of the consideration of the industry, and of being pressed forward in the usual parliamentary channels.

A Few Suggestions.

The first suggestion he wanted to make was in regard to whether or not gas was going to be charged on the basis of heat units, or continue to be based on the principle of cubic feet. It seemed that if a change to heat units were made, it would be rather an anachronism that the dividend-earning capacity of a company should be based on the price charged to the ordinary consumer. The ordinary consumer might bulk largely in the quantity of gas supplied; but it seemed to him, from the national point of view, it was equally important that there should be every incentive given to the undertaking to supply gas as cheaply as possible, and to any large quantity for industrial purposes. There was no incentive now, except the incentive of competition and common sense, to undertakings to supply gas cheaply—in fact, they were penalized in addition, because the lower they supplied gas to which the sliding-scale did not apply the less profit they made. Let the gas industry make up its mind that the sliding-scale, being based on the price of gas, should be on the average price of gas to all consumers. That was to say, that the total revenue would be divided by the total quantity of gas consumed, and would thus give the average price. There might be difficulties in extreme cases; but in a general way he thought it would work out satisfactorily.

A Co-Partnership Arrangement.

The next suggestion he had to make concerned the great number of gas undertakings with profit-sharing schemes; and he wanted to suggest for the consideration of the industry that in all circumstances for the refixing of the sliding-scale they should universally ask that a certain proportion of the surplus profits over the standard dividend should be payable to the management and shareholders, and a certain proportion as a statutory right to the employees in the undertaking. This would only apply to sliding-scale companies; but he did not see why equivalents should not be given to municipal employees as well, instead of giving the gas consumers the whole benefit of any reduction it might be possible to make in the price of gas. There was an alternative—namely, to base the sliding-scale on the average receipts per ton of coal carbonized. It would be quite equitable and easy to make the standard price shift automatically with the price of coal. And, secondly, the untoward situation that had arisen, whereby a further increase of capital in gas undertakings and the distribution of profits to the management and shareholders was unfair, would be avoided. If they based their sliding-scale on the total receipts per ton of coal, they could make their standard price slide with the ton of coal. In this event, shareholders would be protected against an increased cost of raw material, and would also be protected—as they were not now—against a drop in the market price of residuals. There were many possibilities in the more intensive work concerned with bye-products. In the production of coke, sulphate, and tar, it appeared to him that if all these were comprehended in the thing upon which their award was based, it would be an incentive and help to reward.

Stock Redemption.

The next point he thought the industry should press for was the right of redeeming stock under the Companies Redeemable Stock Act. The Act excluded gas and electrical undertakings, which should have the right to raise redeemable stock. A question for their consideration was that, having regard to the very limited amount of reserve that every maximum-price company, standard price company, or municipal corporation was allowed to build-up by Statute, gas undertakings should press for the right to redeem a certain amount of redeemable stock out of revenue. Compared with other business undertakings, gas undertakings were absurdly hampered in the way of proviking sinking funds, redemption funds, or reserve funds.

A New Act Wanted.

The next point that he wished to make was that the laws generally governing the foundation of gas undertakings were altogether antiquated. He cited the Gas-Works Clauses Act of 1847 and the 1871 Act. In his opinion, these should be revised and incorporated in a fresh Act. He did not know how many of them realized that a very large proportion of the clauses that went to make up the charter of a municipal gas undertaking or a gas company were based on clauses that were not in the Gas-Works Clauses Act at all.

The Working-up of Bye-Products.

In such revision of the laws, the gas companies should have one more tilt at the one-third restriction, which was in the maintenance of works clause, and referred to the treatment of bye-products.

Most companies worked-up residuals; and the restriction was at the instance of the chemical industry. Having regard to the tendency to combine, he believed that gas undertakings should be encouraged to go into schemes of combination, and, by process of selection, to fix on particular works for doing particular things. If they took sulphate of ammonia, the amount of this obtained per ton of coal now did not represent anything like the nitrogen in the coal which might, by a more perfected system, be got out of it. He did not know of a gas undertaking which worked up its own sulphur to make it into sulphuric acid; but if they had a clear charter, he did not see why it should not be done in their particular works from the spent oxide from which sulphur was collected. If they had a clear field, they could put capital down, and, by more intensive work on bye-products, what a lot could be done. This was what he meant by a forward commercial policy. He thought they should have a clear charter to combine, and to look upon the matter of working-up bye-products from the point of view of groups of gas-works working together, and doing the thing on a large scale economically.

Referring to the London Coke Committee, he did not think the gas industry fully envisaged the advantage there was in burning coke for fuel. The advantages of coke for steam-raising over raw coal were so tremendous that he did not see why any Government Department, arranged in a proper way, should not practically prohibit the use of coal where coke was available. There should be a right of gas undertakings to go outside their own areas to combine for a common purpose—that was, in respect of the manufacture of bye-products in gas-works.

Speaking of the heating of water by gas, it seemed to him that the failing of perfection at the present moment in heating water by gas prevented any great steps forward in this direction. If they increased the efficiency of the water-heater by 10 p.ct., they decreased the amount of gas required to be used by exactly the same figure. The gas-engine was exceedingly efficient, thermally, for the production of power.

Quality and Pressure.

Mr. Abady went on to refer to the report made to the Board of Trade by the Fuel Research Board, and said its recommendations as to the testing of gas stopped incentive and freedom of action of gas undertakings, and were therefore detrimental to the interests of the public. They should press for the right to fix their own calorific power, and also for the right to charge in B.Th.U. or cubic feet. Inerts were restricted to 12 p.ct.; but it might be quite immaterial to the consumer whether he got 12 or 30 p.ct. of inerts in his gas, so long as he obtained his cubic feet. It seemed to be a retrograde step to reimpose a restriction in the matter of carbon bisulphide. The gas companies had an inducement to remove sulphur, as they had a use for it to-day. As to pressure, the pressure of 2 in. at the consumer's meter seemed to be unfair. He did not think the gas company should be responsible for the pressure of the gas beyond the terminal of their own pipes. He would, however, make it penal for the pressure to vary without notice.

Super-Power Stations—An Alternative.

Mr. Abady next dealt with the suggestions now being made that national fuel salvation would be reached by the erection of super-power stations for generating electricity, and spoke of the relative advantages of gas, coke, and electricity. During war time, if they spent £1 on a ton of coal, they obtained 5s. back in bye-products. The thermal efficiency of coke and gas combined was equal to 75 or 80 p.ct. In regard to electricity, they had no foolish bias or prejudice, or want of appreciation of its advantages or limitations; but they knew that the major part of the heat in coal was wasted in being converted into electricity. The question of the super-stations was one for very careful consideration.

Mr. Abady's alternative to the proposed Electricity Commissioners and District Electricity Boards was the formation of a Director General of power, heat, and light, with local fuel councils controlling the winning and use of fuel in conjunction with consumers. He did not mean Government control. They could not segregate the production of coal from its use, and therefore he would divide the country up into localities according to industrial identity, and would put the widest possible representation on the local fuel council, and so, by mixing up everybody in this way for the conservation of fuel, they would lead to the greatest service to the country.

The President said the paper raised many controversial points; but one with which he was in favour and had often thought of was as to the redemption of capital out of revenue. All public utility companies should be allowed to do this.

Mr. Thomas Hardie (Newcastle) did not think he could agree with Mr. Abady in a good deal of what he said. He contended it would be a mistake to make the standard price of gas vary with the price of coal, because generally speaking he thought they had in the price of residuals a set-off against the cost of coal.

Mr. Abady interjected that residuals had not advanced to anything like the same extent as coal, because of the restrictions there had been on some of them.

Mr. Hardie went on to say that what had penalized gas companies was the varying value of money. The standard dividends were fixed, and therefore they had not varied with the value of money. The Government, even, had now to pay more for money. Before the war, while gas companies paid (say) 5 p.ct. in dividends the Government paid 3½ p.ct. But now the latter paid 5 p.ct.; and to keep their relative positions gas companies should be able to pay 6½ p.ct. If they were allowed to do this, they could carry on very nicely. As to the Fuel Research Board, he thought the freedom they had granted with one hand they had taken away with the other. Regarding the use of coke or coal, he urged that the gas industry required freedom to act as they thought best in different circumstances. Comparing electricity with gas, he said they could easily show that gas was the cheapest. He was not in favour of any form of national control.

Mr. C. Dru Drury (Sunderland) said the report of the Fuel Research Board seemed, on the whole, to give them a certain amount of freedom. Inerts to the extent of 12 p.ct. he considered too low. With regard to gas pressure, his feeling had always been to maintain high pressure in the mains, and supply a governor, so that every consumer could have what pressure he wanted.

Mr. H. Chamberlain (Workington) said progress was impeded by the Local Government Board rules and regulations, which were not intended to apply to commercial undertakings.

Mr. Charles Wood (Bradford) did not agree with Mr. Abady in regard to the thermal efficiency of gas and coke.

Mr. H. E. Bloor (York) said when Mr. Abady told them that they got 5s. back in bye-products for 20s. spent in coal, he really meant, he (Mr. Bloor) took it, that measured in terms of money they had the 5s. as a set-off against the cost of the coal.

Mr. C. H. Armstrong (Wallsend) and Mr. A. C. Hovey also spoke.

Mr. Abady replied to the discussion, and was thanked for his address.

Mr. Bloor, of York, was elected President for the ensuing year; Mr. A. W. Branson, of West Hartlepool, Vice-President; and Mr. T. P. Ridley and Mr. J. E. Morfitt, Members of Committee. Mr. Herbert Lees, Hon. Secretary, was re-elected for the eighteenth time; and Mr. C. H. Armstrong was re-elected Auditor.

Removing Clinkers from Water-Gas Generators.

An account of an arrangement to remove side-wall clinkers from water-gas generators was given by Mr. G. I. Vincent, in a paper which he read before the American Gas Association. The war period, of course, brought about a marked deterioration in the quality of fuels; and as far back as two years ago it was realized that the matter was becoming serious. The first idea tried was to put the fire-cleaning on piece-work; but as the quality of anthracite continued to depreciate, a further innovation was made, by installing a machine for more rapidly removing the side-wall clinkers. Speaking generally, this has been so successful that no increase in cleaning time with the further depreciating fuel has been observed. The device consists of a bar weighing 600 lbs., with a wide chisel point. The bar is carried by a cable running over a permanent pulley over the coal-hole branch of the generator. The cable is attached to a rope, which runs to a small electric-driven hoist, where the rope is passed three times around the winch-head. Five men are required to handle the rope behind the hoist, and two are needed to steer the heavy bar—this total of seven men representing the entire cleaning gang. By tightening-up on the rope, the hoist lifts the bar to any desired point, and loosening the rope allows the bar to drop by gravity. This device, Mr. Vincent declared, will remove the present bad side-wall clinkers from an 11 ft. generator, in an average of twelve minutes' running time; and it is found to be no harder on the side-wall liner of the generator than the old method of clinkering. It is, however, harder on the lining of the coal-hole branch, which has to be watched and repaired at more frequent intervals.

Utilizing Light Oil Recovery Plants.

In consequence of the demand for toluene as a raw material for the manufacture of high explosives, over fifty plants for its recovery were erected in the United States during the war period. A few of these were built by the gas companies on their own initiative; but by far the greater number were installed by the Government. The plants represent the investment of many millions of dollars, as they were put up under high pressure, with labour and material costing from 100 to 300 p.ct. above what were hitherto considered to be normal figures; and now the owners are confronted with the problem as to what use can be made of them. In order to assist the industry in general to a solution of this, and to develop if possible any new uses to which the plants might be put, the Chemical Committee of the American Gas Association directed Mr. W. H. Fulweiler to inquire of the various gas companies operating recovery plants their views on the subject. Inquiries were made of 31 companies operating 54 recovery plants; and 23 replies were received from companies representing 40 of the plants (28 of them Government plants). Summaries of the various replies have been published; and the effect of these seems to be to show that the present opinion regarding the utilization of light-oil recovery plants in the United States is that the recovery plants have no "going value" as such, owing to the apparent excess productive capacities of the coke-ovens over the country's normal requirements. Where the plant is owned by the company, and has been presumably written-off, it may be possible to produce a motor spirit for purely local consumption at a small profit. In the case of about one-third of the Government plants, portions of the plant may be utilized by the local companies for washer coolers and tar dehydrators, tankage, &c.; but the value of this apparatus would depend upon the local conditions, and would probably not greatly exceed the scrap value. In the case of the remainder of the Government plants, there seems no commercial use for them and they must be scrapped. In America the competition of gasolene fuel has, of course, to be considered.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Bury St. Edmunds.

The Half-Yearly Meeting of the Association was held last Thursday, at Bury St. Edmunds—the adopted home of the PRESIDENT, Mr. H. R. Wimhurst, the Engineer of the local Gas Company. Some of the members arrived the previous evening, and most of the others were early upon the scene on Thursday morning. Many of them spent the leisure time in visiting some of the historic Abbey ruins and the beautiful churches in the borough.

A LUNCHEON.

At one o'clock the visitors were entertained to lunch by the Chairman (Mr. John W. Greene) and his colleagues of the Board of the Gas Company—Alderman Ridley Hooper, J.P. (the Vice-Chairman), Mr. C. A. Best, Mr. R. P. Plumpton, Alderman Alex. Mitchell, J.P., and Alderman Owen A. Clerk, J.P., O.B.E., the Mayor. The Secretary of the Company (Mr. Oliver A. Lusher) was also present, as was the Chairman of the Society of British Gas Industries (Mr. Archibald P. Main). The excellent lunch having been thoroughly enjoyed,

The toast of "The King" was honoured.

The CHAIRMAN (Mr. Greene) said the pleasant duty devolved upon him of proposing the toast of "The Eastern Counties Gas Managers' Association." It was a gratifying thing to the directorate of the Gas Company to meet the members of the Association; and the pleasure was much enhanced on this occasion by the fact that their friend and Manager (Mr. Wimhurst) was this year the President. He congratulated Mr. Wimhurst upon the honour, and he also congratulated the Association on the man they had seen fit to select, felicitating the Gas Company upon the reflected honour which had been brought upon them by their Manager having been appointed to the presidency. He had learnt as he came into the room that they were in the happy position of being able to welcome Mr. H. Wimhurst, sen., a Past-President of the Association. It was a somewhat unusual occurrence that a Past-President who was the father of the acting President of an organization such as this should be in the happy position of being present to see his son in the chair he himself had occupied. In reading the account of the last meeting, he saw that Mr. Troughton, in proposing that the meeting should be held at Bury St. Edmunds, described it as the hub of the Eastern Counties. He (the Chairman) did not quite know what Peterborough, Ipswich, Norwich, and some other places in the Eastern Counties would say to this; but it did not lay upon anyone in the borough of Bury St. Edmunds to quarrel with the description. [Laughter.] There was also another pleasing fact, that not only was the borough an ancient and well-known one, but they were meeting in the rooms of the historic inn which had—he was going to say been hallowed, or at any rate made romantic by the immortal Mr. Pickwick, who took refuge within its walls. It gave the Gas Company the greatest pleasure to see the members of the Association there. He should, however, consider it an impertinence to say very much about the technical parts of the work of the gas industry. His experience as a Director of the Company had always been under the pupilage of his friend (Mr. Alex. Mitchell); and those who served as Directors with him felt that it was hardly necessary to know anything about the technical side of the business as Mr. Mitchell always kept them in a straight path. All connected with a gas company had in recent years been going through strenuous times—indeed, the industry might take great credit to itself upon the fact that it was called upon by the Government to provide important ingredients for the making of explosives and meeting other war requirements. The industry, however, had been passing through difficult times; and he feared the difficulties would continue for some time. But he saw no reason to doubt that there was a great future before the gas industry, and that this would mean considerable activity, resourcefulness, and enterprise, with close application to the scientific and technical part of the work. These things were greatly helped and stimulated by the existence of such Associations as this.

The PRESIDENT, on behalf of the members, heartily thanked the Chairman for his appreciative remarks on the usefulness of the Association, as well as for the substantial way in which the Board had extended to their visitors such substantial hospitality. This appeared to be a red-letter day in the affairs of the Association. The members had been looking forward to it for some months now. It was a proud thing for him to know the members should have selected Bury St. Edmunds as the town in which to hold their first post-war meeting. It was twenty-five years since the Association met in the borough; and many of the old members looked back upon the gathering then with a great deal of pleasure. It would have been noticed by the Chairman's remarks that he took an active interest in the affairs of the industry, and more particularly of the Association. He was very conversant with all the industry was generally doing; and he (Mr. Wimhurst) was very proud to serve under such a Chairman as well as the other members of the Board. He was fortunate in possessing such an ideal Board. They had shown a very earnest desire to make the meeting a success, and to ensure the comfort of the members.

Mr. W. W. TOWNSEND (Colchester), Vice-President and President-elect, proposed the toast of the "Bury St. Edmunds Gas Company." He remarked that he was glad to see his friend Mr. Wimhurst in the position he now occupied. The members all knew of his technical knowledge and engineering capacity, and his worth as a man. They all respected him. It was because of these things (as the Chairman had recognized) that the members had conferred upon him the highest honour it was in their power to bestow. As to the Association, he might just say that it did a great deal of good; and the members had especially felt the benefit of it during the trying years through which they had been passing. The information obtained from each other had been very valuable; and now that peace had arrived, and fresh developments were before them, their meetings and conferences would be still more valuable. None of them, he was sure, would be able to do his work so efficiently if it were not for these technical and commercial meetings. The toast he had to propose, he was certain, would be drunk with the greatest heartiness. They wished to express their thanks to the Chairman and Directors for their kindness; and to wish them and their enterprise the greatest of prosperity. He was glad to hear the Chairman, despite difficulties and troublesome problems, took a very hopeful view of the future of the industry. They all felt the same. They were now wrestling with new problems; and the report of the Fuel Research Board, as well as information from other quarters, showed what inherent strength there was in the gas industry. If they could bring out the full advantage of the power which was in the hands of the industry by the adoption of improved methods—not only in manufacture but in sales—neither the electric super-stations nor anything else would check the industry in its forward career. The prosperity which was in front of them would, they all hoped, be fully shared by the Bury St. Edmunds Gas Company.

Alderman RIDLEY HOOPER acknowledged the toast; and he supplemented the Chairman's expression of delight at seeing so many members of the Association present.

The Business Meeting.

Subsequently the business meeting was held in the same room—the PRESIDENT (Mr. H. R. Wimhurst) in the chair.

MINUTES CONFIRMED.

Moved by Mr. J. W. AUCHTERLONIE (Cambridge), and seconded by Mr. T. A. GUYATT (Ely), the minutes of the last meeting were confirmed.

THE LATE MR. CARPENTER.

The PRESIDENT said it was his unfortunate duty to have to propose that a vote of condolence be sent to Miss Carpenter and her brothers on the death of their father (Mr. Carpenter, of Yarmouth). It was to the regret of all the members that they heard the sad news. Mr. Carpenter, he believed, was one of the founders of the Association. It was almost a singular coincidence that it was just twenty-five years ago that Mr. Carpenter sat in the Presidential Chair at the last meeting held at Bury St. Edmunds; and his death almost coincided with the date of the present meeting. He moved that the Hon. Secretary (Mr. F. M. Paternoster) be requested to write to Miss Carpenter, expressing to her and her brothers the sympathy and regret of the members on the loss of her father.

Mr. H. WIMHURST (Sleaford), in seconding the proposition, remarked that he must correct the President on one point. Mr. Carpenter was not one of the founders of the Association. He joined in 1890, two years after the formation of the Association.

Mr. J. H. TROUGHTON (Newmarket) wished to support the motion, and to say how extremely sorry each one felt that their friend had been called away so comparatively early in life. They all respected him exceedingly. He was a valued member of the Association, and one of their earliest Presidents. He was a man who took the keenest interest in all matters appertaining not only to the Association, but to the industry throughout. He was an able engineer, and always willing to give his fellows the benefit of his ripe experience. He was a man who would be greatly missed not only by the Association, but by Yarmouth. Mr. Carpenter's health had been very indifferent since he lost his wife.

The motion was carried by the members silently rising in their places.

AND LIEUT. DAVIS.

The PRESIDENT remarked that the members would also have noticed that the Association had sustained another loss by the death of Lieut. J. F. Davis, son of their friend Mr. Joseph Davis, of Gravesend. The Hon. Secretary had written to Mr. Davis conveying the condolences and sympathy of the Association. In Lieut. Davis they had lost a very promising young man, who was known to most of the members by the active way in which he assisted his father during his secretaryship of the Association. It was with great regret they learned of his untimely death.

SALARIES OF OFFICIALS.

The PRESIDENT said there was a matter which had exercised the minds of most members of the Association. It was the question of the status and salaries of engineers and managers. He did not think this was a matter that it would be wise to discuss that day. It had been discussed in the technical papers, and had been before other Associations. The matter was receiving the attention of the Institution of Gas Engineers; and it would probably be brought forward at the annual meeting this month, when any members who desired to air their views on the subject would have an opportunity of doing so. Any members wishing to communicate with the Association on the subject could make use of the question-paper sent out with the notice convening the meeting.

ELECTION OF NEW MEMBERS.

Proposed by Mr. H. G. RUGGLES (Leighton Buzzard), and seconded by Mr. J. H. TROUGHTON, the following gentlemen were added to the membership roll: Mr. Frank Pinder, of Hatfield; Mr. John Livingstone, of Maldon; Mr. W. S. Venner, of Brentwood; Mr. Frank Hargrave, of Alford, Lincs.; Mr. T. F. Canning, of Southend-on-Sea; Mr. Charles Fowler, of Leiston; and Mr. Arthur John Goats, of Biggleswade.

REPORT AND ACCOUNTS.

There was a little discussion as to the accounts; but subsequently both they and the report were adopted, on the motion of Mr. J. H. TROUGHTON, seconded by Mr. WIMHURST.

The report consisted largely of a review of the proceedings of the past year; and it concluded as follows:

The year commenced with a membership of 125. During the year seven members and one associate-member were elected, and one member resigned. The Committee regret to report the death of Mr. F. Kent, of Worksop. The total membership at the end of the year was 131.

The accounts showed a balance due to the Treasurer of £8 6s. 8d.; the subscriptions received amounting to £62 14s., and the expenditure to £97 15s. 1d. There was a balance brought forward of £26 14s. 5d. The deficit is explained by the increase in the affiliation fee paid to the Institution of Gas Engineers, the expense of the Association representatives attending meetings of the National Gas Council and other Conferences, and the increased cost of printing. Now that the National Gas Council has been reorganized, the item for the expenses of the Association's representative will no longer appear in the accounts; and the Committee hoped that the increased subscription will enable them to show a balance in hand at the end of 1919, though the necessities of the times and the altered conditions of the industry must tend to an increase in the expenditure compared with the years previous to the war, if the Association is to study the full interests of the members.

With regard to the "Reports of District Associations," which are being offered to the members at the nominal price of 5s. per volume, the Committee still require applications for about 20 copies, and trust that orders for these will be placed with the Secretary without delay.

The Committee wish to impress on members the valuable work which is being done by the Commercial Sections; also the importance to the industry of supporting to the fullest possible extent the reorganized National Gas Council and the separate Committee of Employers.

The Committee have received with great regret the news of the death of Lieut. J. F. Davis, M.C., as the result of a severe operation in the Cambridge Military Hospital, at Aldershot; and sincere sympathy will be felt by the members for his father, Mr. J. Davis, of Gravesend, a Past President and late Secretary of the Association. Lieut. Davis was also a member of the Association; and before the war was acting as assistant to his father at Gravesend.

The PRESIDENT then delivered the following

PRESIDENTIAL ADDRESS.

I feel that I must again thank you for the honour shown me in electing me as your President for this year. Your action in so doing is doubly appreciated by the fact that my year of office should coincide with the cessation of what has become known as the "Great War," and the commencement of that long-desired period when victory and peace would be the reward of our stupendous sacrifice and efforts.

It has been the devoutedly expressed wish of several of my predecessors in this chair that their year of office would witness the "dawn of peace." They were, however, successively doomed to disappointment in the denial of that happy event. But nothing can deprive these gentlemen of the knowledge and satisfaction that they navigated the fortunes of the Association through the most trying and momentous period in its long history, sparing neither themselves, their wishes, nor their leisure, in advancing its usefulness—thus earning the unstinted and oft-repeated thanks of every member.

STRENUOUSNESS OF THE INDUSTRY IN WAR TIME.

We are now at liberty to review the work and conduct of our great industry during this last strenuous period of war. In examining its actions and policy, one immediately becomes conscious of the fact that it has nothing to reproach itself with—the many appeals and demands on its resources have always been loyally and willingly conceded. One moment it was for the increased output of a certain product, then for a reduced consumption of raw materials. Instructions and counter-instructions were issued with bewildering rapidity, clearly pointing to hasty and ill-considered decisions, and also overlapping on the part of the Government Departments concerned. In spite of all these discouraging signs, those in charge of gas undertakings "carried on," striving their utmost to comply with the seemingly impossible, and relegating to the background any hope of reward for their efforts, or financial return on outlay to which many undertakings were committed.

Few industries in the kingdom have contributed so much, or have been so essential, to the vigorous conduct of the war—providing material the absence of which would render high explosives impossible, providing an easily-applied source of power and heat to the huge munition factories which magically sprang up in all parts of the country, also contributing largely to the supply of fertilizers, the extended application of which went a great way to make this country almost self-supporting in the matter of food requirements. All this has not been in vain; the objects which prompted these strenuous efforts have been gloriously achieved. These are accepted as our reward.

POST-WAR ACTIVITY.

The post-war period, the advent of which we have all been so anxiously anticipating, is now upon us. The ensuing period will be one of furious activity with gas undertakings. There is much leeway to make up—many postponed repairs, renewals, and extensions of both manufacturing and distributing plant to be carried out. This problem will be one to call for serious thought. The cost of all material and plant has advanced to such an enormous extent that many will endeavour to further postpone their schemes, hoping that prices will become easier in the near future. These hopes are, however, not likely to materialize for several years. The great demand for structural material for rebuilding the war-devastated areas, making good the losses to shipping, carrying out vast housing schemes, and re-equipping our transport systems, will tax the entire labour and material resources of the universe for many years to come. The existing uncertainty and unrest in the industrial world is frankly not conducive to unlimited reconstruction; but it seems that it is a duty we owe the State to embark on some partial and remunerative scheme that will absorb the vast amount of labour liberated by the demobilization of the Army—thus assisting in reducing the amount of unemployment, which is an increasing source of expense to the country and embarassment to our statesmen.

Of the numerous pressing problems that confront the gas industry, the operation of the sliding-scale and maximum prices call for immediate remedy. Only a drastic revision of existing enactments can stabilize undertakings and make it possible to continue the energetic policy and initiative that have distinguished it in the past and done so much to merit the confidence of the investing public. Our new organization, the National Gas Council, which is rapidly emerging from the embryonic stage, can we feel be safely left to deal with this phase of affairs, and induce our legislators to adopt a line of thought more in keeping with British ideas of justice and fair dealing.

THE COAL POSITION.

The acute problem of coal supplies still remains unsolved. The disclosures made at the recent sittings of the Coal Commission were of a startling nature, and have convinced the British public that all is not well with the coal mining industry. The feeling of suspicion and lack of understanding between the miners on one part and the colliery owners on the other part appear to be at the root of the matter. No reasonable individuals wish the miner to be underpaid for his arduous and dangerous work, or to be able to procure a cheap supply of fuel for their profit or comfort, at the expense of his well-being, his life, or limb. It is expected in return that the miner should consider the other industries of his country, and the welfare of his fellow citizens, and strive to furnish a plentiful supply of the commodity upon which the vitality and strength of the nation depend.

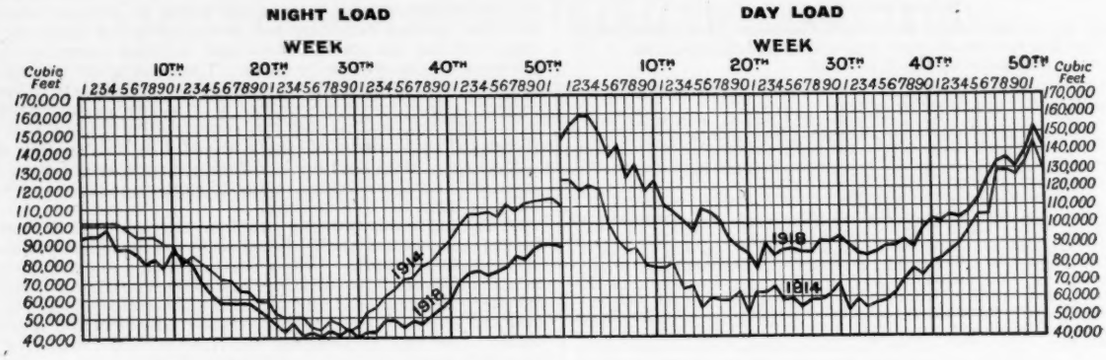
The owner and miner are each in turn inclined to the view that coal was placed in the earth by a bountiful Providence for their benefit alone, and entirely overlook the claim of the remainder of the community. It is to be hoped that the chief aim of the Coal Commission will be to handsomely reward that long suffering, and consistently ignored, third party to the deal. The fall in the annual output per miner from 315 tons in 1886 to 246 tons in 1912, with a further reduction since that year, gives us very substantial grounds to fear a greater reduction with the introduction of the suggested shorter working period. When our output per miner is compared with that obtaining in the United States—which is 577 tons and 660 tons over the same period—it becomes obvious to all that there is something seriously wrong with the coal industry; and unless drastic reforms are inaugurated, we shall have American gas coal competing with our own product in the home markets of this country.

Nationalization of Coal Mines is stated by some to be the only means of obtaining the desired solution. Our experiences of State control during the past four years should serve to damp the enthusiasm of the most ardent supporters of this unpopular principle. All are unanimous, however, in agreeing that a modified form of State control is necessary. This control could be most usefully applied in operating a sliding-scale arrangement to regulate and vary owners' profits and miners' wages inversely to the rise and fall in coal prices at the pit head. The question of the comparative values of different classes of coal should be taken in hand, and their value fixed according to the percentage of volatile matter and fixed carbon. Where coal is used for purposes other than gas making, the value would be controlled by the calorific value of the fuel. In all cases a steep scale of minus points would be allotted coals containing more ash matter than (say) 5 p.ct.

INDUSTRIAL OUTLOOK.

Labour questions call for all the tact and conciliatory spirit that gas authorities can exert. The pre-war rate of wages and working periods will never again prevail. The burden of concessions made is a serious one, and more particularly so to the smaller concerns. In the case of the undertaking with which I am associated, the labour costs per 1000 c.ft. of gas sold have increased from 7·3d. to 11·6d. This increase for the time being has been borne by shareholders and consumers combined, trusting that in the meantime improved and more economical methods of manufacture will enable us to resume our policy of cheap gas, and cheaper still gas, without which policy our industry cannot hope to survive the several rivals in the field. It would appear that the correct solution of the rising labour costs is to increase the output per employee. This can only be effectively carried out by the introduction and aid of machinery. Many of the smaller undertakings that have hitherto thought their operations were on too limited a scale to permit the profitable use of machinery, will find it to their advantage to call in mechanical aid to the coal-handling, carbonizing, and coke-handling operations, and in some cases in filling and emptying purifiers.

With the shorter working hours now in force, it will be found that a general speeding-up will be essential. It is only by the assistance of such appliances that necessary routine work can be got through in the allotted time. Fatigue on the part of workmen will be in great measure eliminated, and their lot rendered a happier and more contented one, which in turn will enhance the



AVERAGE OF THE DAILY OUTPUTS AT BURY ST. EDMUNDS FOR THE WEEKS OF 1914—1918.

general all-round efficiency of gas manufacturing operations. Obviously a fatigued man is a short-tempered man, apt to magnify his troubles and develop into a prolific producer of grievances. The only sovereign remedy is to remove the prime cause—in other words, reduce unnecessary fatigue. In some of the small gas-works (of which there are many in the Eastern Counties) the introduction of the proposed eight-hour shift will impose yet another burden to those already over-burdened undertakings. The expense of introducing the extra shift in the twenty-four hours will in many cases be sufficient to convert the narrow margin of profit into one of loss. Any works with an annual make of less than 15 millions, it is hoped will be exempted from working eight-hour shifts.

POSSIBILITIES OF A "STANDARD GAS."

The character, calorific value, and composition of the gas we are to distribute in the future furnishes a field for epoch-making research and discussion. It is a field worthy of the finest intellect our industry or the allied sciences can produce. We must all feel impatient at the apparent delay on the part of the expert opinion of the industry in arriving at a more or less unanimous decision as to the future standard quality of gas. The present age is essentially one of specialization and standardization. It would therefore appear to be only a natural outcome to have a "standard gas." With such a product, manufacturers of gas apparatus would operate on much safer ground, and be able to standardize their goods; and we, in turn, would rest assured that the apparatus we purchase and instal would give the duty and the efficiency claimed for them.

It is admitted there would be difficulties in the way of fixing a national standard, owing chiefly to the varying classes of gas-making material available in different localities, and also to the predominant use to which the gas is put in various districts, or whether it is a residential or an industrial one. These obstacles should not prove insurmountable provided we adhere to the "gas as a fuel" point of view. The methods of production can, in the light of recent discoveries, be made adaptable to varying qualities of raw fuel, and the resultant gas can, in modern or modified apparatus, be used with as high an efficiency as, if not higher than, has ever been attained.

It is impossible at the present stage of developments to name the grade of gas that will ultimately be adopted. The exponents of 350 B.Th.U. gas at one end of the scale, and those of nothing less than 550 B.Th.U. at the other end, have each in turn made a telling case. The thermal efficiency of the 350 B.Th.U. gas process, with its 20,000,000 B.Th.U. per ton of coal, is a most attractive proposition, and inclines one to distrust the process that at present only gives us approximately a 7,000,000 B.Th.U. multiple. However desirable it may be to attain the first-named high efficiency, it remains to be proved whether the resulting gas is one that can be universally distributed and applied to existing gas-consuming apparatus. On the other hand, gas of a calorific value of 450 to 500 B.Th.U., giving a B.Th.U. multiple of from 9,000,000 to 10,000,000, is being successfully distributed by more than one gas undertaking, and reported as giving satisfactory results in existing consuming apparatus—thus clearly indicating the direction of our objective.

With this last-mentioned grade of gas, the inert or incombustible content varies in different works from 13 to 21 p.ct. Of this percentage, by far the greater portion consists of nitrogen. It should be quite possible to sensibly reduce the amount of this element—thus putting the supplier in a position enabling him to assure his consumer that he is being supplied with gaseous fuel containing the highest possible percentage of combustible matter, and that he is not being charged for matter a gratuitous supply of which he has on his own premises. We are fortunate in having more than one method at our disposal for producing these lower-grade gasses. We have the choice of making our retorts into combined coal and water gas generators by passing steam through the charges contained therein, or mixing with our coal gas a percentage of blue water gas produced in a separate generator, or completely gasifying the raw coal in a modified form of water-gas generator. We have here a selection of methods that are applicable to works of all sizes. The two former methods are now well known and eminently successful. Of the latter method, we would like more information. In theory, the process is the ideal one. It is stated that two or three small installations are being successfully operated in this country; so no doubt more information will soon be available as to the heat efficiency, and also the yield of bye-products, from this process.

Intimately connected with the question of calorific value is that of distributing pressures. The once universal statutory minima of 6-10ths to 8-10ths of an inch have long been obsolete. Nothing less than 30-10ths should be available at the consumer's apparatus if we are to continue to give him an efficient and expeditious service. This may mean an overhaul of many distributing systems; but the expenditure would be more than justified.

DAY AND NIGHT LOAD FACTORS.

During the past four years a decided change has become manifest in the day and night load factors. The lighting restrictions (now fortunately removed), the Daylight Saving Bill, and earlier closing of business establishments caused a considerable drop in the lighting load. On the other hand, the daylight load, owing to the increased use of gas in manufacturing processes, the increasing popularity of gas for cooking and domestic heating, in the face of dearer and scarcer coal, caused a larger daylight demand. An examination of the charts shown herewith clearly indicates the effect of the changes on my undertaking. The net result, comparing the year 1918 with the year 1914, is as follows:

	1914. C.Ft.	1918. C.Ft.	Difference. C.Ft.
Daylight output	30,491,000	39,820,000	+ 9,329,000 or 30·6 p.ct.
Night output .	29,211,000	23,730,000	− 5,481,000 or 18·7 ,,
Total output .	59,702,000	63,550,000	+ 3,848,000 or 6·4 ,,

These figures show a striking change in the periods of demand for gas. It is doubtful whether the night output will be recovered with to-day's tendency to earlier shop closing, and the consequent reduction in the outside lighting of big establishments, though we hope, by increasing the popularity and pushing the sale of domestic gas-fires, to sensibly increase the evening demand. With regard to the daylight output, we have no fears. There is plenty of undeveloped ground awaiting our efforts as soon as material, labour, reasonable costs, and other circumstances will permit.

THE BASIS OF SELLING GAS.

The suggestions recently made to alter the method of selling gas are decidedly opportune. We can no longer be considered purveyors of light; rather we are purveyors of gaseous energy. Therefore our product should be sold and priced according to the amount of energy contained in it. Unfortunately the piece of apparatus known as the "consumer's meter" cannot yet be caused to record and register the number of heat units passing through it. This means that a series of conversion tables will have to be introduced, in order to convert the bulk registration into heat units—and, it is feared, to the great bewilderment of the average consumer. So long as consumers' meters are constructed to record volume only, it is my view that our quarterly accounts can only be priced out at the thousand cubic feet. There is, however, no reason why the rate per thousand should not vary according to the average calorific value of the gas supplied during the quarter in question. This average would obviously be ascertained and fixed by an independent testing authority.

The practice of selling gas by the hundred cubic feet instead of by the thousand is finding many supporters in the industry; and there is much to be said in its favour. The "hundred" cubic feet is a quantity that would be more readily understood by the consumers. It is a unit that can be sold at a few pence, and more easily comparable with the electric unit. The gas salesman would find it an invaluable weapon when up-against an electrical proposition. He would be able to say something to this effect: "My unit contains 50,000 B.Th.U., and will cost you 4d., whereas the other firm, although asking the same price for their unit, can only give you 3440 B.Th.U.

A NEW TYPE OF METER WANTED.

This subject would not be complete without some reference to consumers' meters. In pre-war times my Company found a stock of fifty meters of various sizes ample for the requirements of their business; now it is found necessary to carry a stock of at least 120. The long period taken over repairs, and the increased number of defective meters, has seriously embarrassed our own and many

other undertakings. The tin-cased dry meter, which for upwards of half-a-century has been an unqualified success, now no longer appears to be able to stand-up to the more exacting demands made upon it. Many defects can no doubt be attributed to continuously working the meter above its rated capacity. This cause and its effect can easily be remedied by the gas supplier, by the adoption of closer methods of inspection and supervision.

The change in the character of the gas made during the past few years doubtless causes the largest percentages of defects—solvents and increased sulphur compounds are equally blamed. We can never revert to our old conditions of gas manufacture. The obvious alternative is for the meter-makers to supply a meter that will stand-up to the altered conditions and the gas of to-day. The piece of hermetically sealed tin and solder apparatus we have long been accustomed to, and described by some as a "box of tricks," is not strictly speaking an "engineering job." We require something more robust and more easily accessible for interior repairs; thus reducing the cost of maintenance. It might even be possible to construct a meter of standard component and easily detachable parts, so rendering it possible to carry out needful repairs on the spot and avoid the delays in transport and at the makers' works. Our meter manufacturers are, I believe, quite alive to the fact that the present type of apparatus has been found wanting, and are only awaiting a definite lead and statement of our requirements to give us what we require.

NAPHTHALENE STOPPAGES.

About two years ago we began to experience at Bury an increasing number of naphthalene stoppages in services and meters. These troubles were accompanied by an increase in the number of "noisy" meters. The matter became so serious that steps were at once taken to provide some remedy. Eventually we decided on spraying into the stream of gas, as it leaves the station governor, a small quantity of ordinary petroleum. The effect was immediately felt; the naphthalene stoppages ceasing within fourteen days of starting the process, and the noisy meters became mute. It has been found by experiment that a supply of one gallon of oil per day keeps our distributing system quite clear of obstructions, and serves to lubricate the interior mechanism of the meters. The oil is sprayed by a small stream of gas at a pressure of 25 lbs. per square inch; this pressure being applied through the medium of a small Westinghouse compressor operated by steam. We anticipate a considerable reduction of meter defects by the continued operation of this process.

SLOT INSTALLATIONS, COOKER HIRING, &c.

One of the matters that is agitating the minds of gas undertakings is the future policy to be adopted with regard to slot installations, hiring cookers, and other free work. The cost of meters, apparatus, piping, and the installation thereof has increased so enormously that the existing hire rates and the extra charge for slot gas no longer gives an adequate return on the capital outlay. In pre-war days my undertaking was able to instal a complete slot installation—including service, meter, three lights, and ring—for £4 11s.; to-day a similar installation costs £9 16s. In the case of cookers, which used to cost us £2 15s., and were hired out at 2s. 3d. per quarter, the cost is now £5 8s. It would not appear to be fair to existing consumers to make an all-round increase in rates, and it would not be convenient to charge an increased rate to future consumers—thus having two separate rates. We have not yet been able to arrive at a satisfactory solution of the problem. In the meantime, we have not resumed free work, which was discontinued when war conditions made it no longer possible to carry on.

IMPROVEMENTS IN GAS APPARATUS.

It is gratifying to note that the manufacturers of gas-consuming apparatus are not content to rest on their laurels; they, on the contrary, are making strenuous efforts to increase the efficiency and reduce heat losses in the apparatus they are putting on the market. The cooker hot-plate, which is notoriously wasteful, has provided a profitable field for inprovement. Externally heated ovens are also being introduced, and have clearly shown themselves superior in many ways to the internally heated type, against which a certain amount of prejudice has existed. Further improvements are also promised in gas-fires. We can reasonably hope that in the near future a gas fire will be produced that will introduce into the apartment 90 p.ct. of the heat units contained in the gas consumed.

In concluding this address, I feel, on re-perusing it, that I have omitted mention of more than one vital matter at present exercising the minds and the thoughts of those engaged in our great industry. Were I to make good the omission, I should perhaps only be traversing the ground already covered by others in similar positions to myself, and thereby unduly weary you. There is for all much work to do and ground to traverse before our industry reaches the ideals it has set out to attain. We at this period stand on the margin of a vast field of usefulness to the community, and by well-organized and co-ordinated advances we cannot fail to make good—thus placing us in a position unassailable, and indissolubly bound-up with the economic life and affairs of the nation.

Mr. E. W. SMITH (Chelmsford) said the members had listened to a most interesting address. They had often heard about the difficulty of finding material for the preparation of an address; but there was not the same difficulty now, or at all events the address to which they had just listened did not bear any evidence of it. It was an address of a character that many of the members would have liked to discuss; but it was never permissible to discuss presidential utterances. As he listened to the address, it reminded him of the old Latin saying which freely translated meant, that "the times are changing, and we with them;" and he thought how strange an address of this kind would have sounded twenty years ago. Fancy them talking, twenty years back, about 20,000 c.ft. of gas, and 10 million B.Th.U. in the gas per ton of coal! Possibly the war had had something to do with the change that had come about. If it had, and if it worked out to the advantage of the gas consumers and the gas undertakings generally, they must not complain. The thanks of the members were due to the President for the address he had read that day.

Mr. A. W. SUMNER (Grays) remarked that the address showed the members that the industry was now in a transition state; and if they were going to work successfully in the future, they would have to tackle these problems. Most of them were getting more and more interested in B.Th.U.

The motion was very heartily passed.

The PRESIDENT thanked the members for their appreciation of his efforts in the preparation of the address.

WATER-GAS PLANT AT COLCHESTER.

Mr. W. W. TOWNSEND (Colchester) read a paper bearing the above title. Together with a report of the discussion, the text appears on subsequent pages.

HONORARY MEMBERS.

Powers were delegated to the Committee to appoint Honorary Members of the Association; it being intimated that the first three such members would be Sir Daniel Goddard (Ipswich), Mr. Alex. Mitchell (Bury St. Edmunds), and Mr. J. T. Jolliffe (Ipswich).

ELECTION OF OFFICERS.

The PRESIDENT, in proposing that Mr. W. W. Townsend (Colchester) be the President for the ensuing year, said they had in him a gentleman well qualified to fulfil the position.

Mr. H. WIMHURST (Sleaford), in seconding, said his esteem, as was that of the ordinary members, for Mr. Townsend was great indeed.

The motion having been unanimously carried,

Mr. TOWNSEND, in returning thanks, said he would do his best to carry out the duties of the office. He hoped that next year they would have more papers from the members. The Eastern Counties Association ought not to lag behind other District Associations either in the number or quality of their papers.

Mr. A. Sumner was appointed Vice-President, on the proposition of Mr. J. H. TROUGHTON (Newmarket), who said he was sure Mr. Sumner would be an able assistant to Mr. Townsend. Under these two gentlemen the Association was bound to prosper.

The PRESIDENT said, with regard to the Hon. Secretary and Treasurer, Mr. Paternoster was desirous of retiring from the office, which he had occupied for four strenuous years—in fact, four of the most strenuous years a Secretary could have had. The allotted period a Secretary should have was seven years; but he thought that, during the past four years, Mr. Paternoster had done as much as any other Secretary had done during seven years. He (Mr. Wimhurst) had tried to persuade Mr. Paternoster to carry on; but he was adamant on the point, so he thought it was only fair to try to get another Secretary. Up to the present they had been unsuccessful. Mr. Paternoster would hand over the reins of office at their September meeting of this year. The Association might leave it to the Committee, the speaker thought, to select or to induce someone to take the position.

Mr. PATERNOSTER explained that he was not in good health; and consequently he had promised his Directors to give up all outside work, and rest as much as possible. He hoped in the next week or so to go away for a holiday. However, he promised that the September meeting should go through so far as the Hon. Secretary was concerned. If by that meeting they had not secured an official, he would try to carry on for a little while, but not permanently. [Applause.]

Messrs. J. H. Troughton, W. H. Mainwaring, and F. M. Paternoster were appointed members of the Committee, on the proposition of Mr. ROBINSON, seconded by Mr. RUGGLES.

Messrs. W. Beale and G. H. Mallett were elected Auditors.

VOTES OF THANKS.

On the motion of Mr. G. H. MALLETT, thanks were accorded to the President and officers of the Association for their past year's work. They all liked to feel that they belonged to a successful organization; but they were apt to overlook the persons to whom the success was due—viz., the President, the Vice-President, the Committee, and not least, although last, the Hon. Secretary.

Mr. THOMAS GLOVER (Edmonton) seconded this motion, which was heartily carried.

ANNUAL DINNER.

The war being over, the annual dinner was revived on this occasion. It was held at the Suffolk Hotel.

Southern District Association of Gas Engineers and Managers.—The summer meeting of the Association will be held at Maidstone on Monday, the 19th inst., by invitation of the Directors of the Maidstone Gas Company. The only convenient train leaves Charing Cross at 11 a.m., London Bridge 11.8 a.m., and arrives at Maidstone East [close to the gas-works] at 12.10 p.m. The members are invited to inspect the works, and then to take lunch at the Star Hotel, at 1.30 p.m. Afterwards a trip down the river has been arranged—a halt being made at Allington Castle. The arrival at Strood is timed for 6 p.m., from which place there are trains back to London at 6.10 and 7.11 p.m.; but it is not certain whether members will be able to catch the earlier train owing to the uncertainty of navigation.

WATER-GAS PLANT AT COLCHESTER.

By W. W. Townsend.

[A Paper read before the Eastern Counties Gas Managers' Association, May 1.]

On being asked to prepare a paper for the Association, the writer had some doubts as to the advisability of choosing this subject, as communications on water gas have been numerous. As recently as our last meeting we had an interesting contribution from Mr. Keable, followed by a good discussion. However, consideration of the present position reveals the fact that the most important questions before the gas industry at the present time are: First, the quality of gas best suited for distribution for all purposes, having regard to the cost of manufacture; and, second, the best method of manufacturing such gas. In considering the matter, we have several things to bear in mind, such as the increased wages and the reduced hours of labour and the high price and uncertain deliveries of coal.

To meet the new conditions, various plans have been suggested. For those installing new plant there are the attractions of vertical retorts, with the possibility of steaming the charge and obtaining a large increase in the yield of the gas without the use of a separate plant. Those who have good installations of inclined or horizontal retorts may adopt steaming of the charges. But the conditions in this case are not ideal; and while the smaller works may in this way obtain some of the benefits of modern practice, it appears to the writer that, in works of larger size, the installation of a water-gas plant offers many advantages, particularly if carburetted water gas can be made when required. In order, however, to obtain the greatest advantage from such a plant, it would appear that, where the conditions permit, the blue gas should be passed through the coal-gas retorts after being previously heated. Up to the present it has not been possible to try this plan at Colchester; the retort-house not being suitable.

The writer is one of those who have been advocating the use of blue water gas for the past two or three years; and experience confirms the view that a good useful gas mixture can be obtained by producing coal gas of good quality in horizontal retorts and diluting it with good quality blue water gas—thereby obtaining a satisfactory yield of gas eminently suitable for present-day uses. The mixed gas is much purer than straight coal gas, contains much less sulphur and naphthalene, and the inerts can be kept at a reasonable figure. About 10,700 c.ft. of coal gas per ton is made and mixed with 4500 c.ft. of blue water gas, giving a total yield of 15,200 c.ft. per ton. The sulphur compounds average about 25 grains, the CO_2 in the mixture about 3 p.ct., and no difficulty is experienced with naphthalene. The calorific power is about 500 B.Th.U. gross—occasionally falling to 480, depending on the quality of the coal. These results are obtained without any of the heavy wear and tear expenses inseparable from the policy of working the retorts at the highest temperature obtainable. As to the financial results, it is obvious that they are satisfactory. The policy has enabled the price of gas to be kept down, in spite of the heavy advances in the cost of coal, labour, &c.

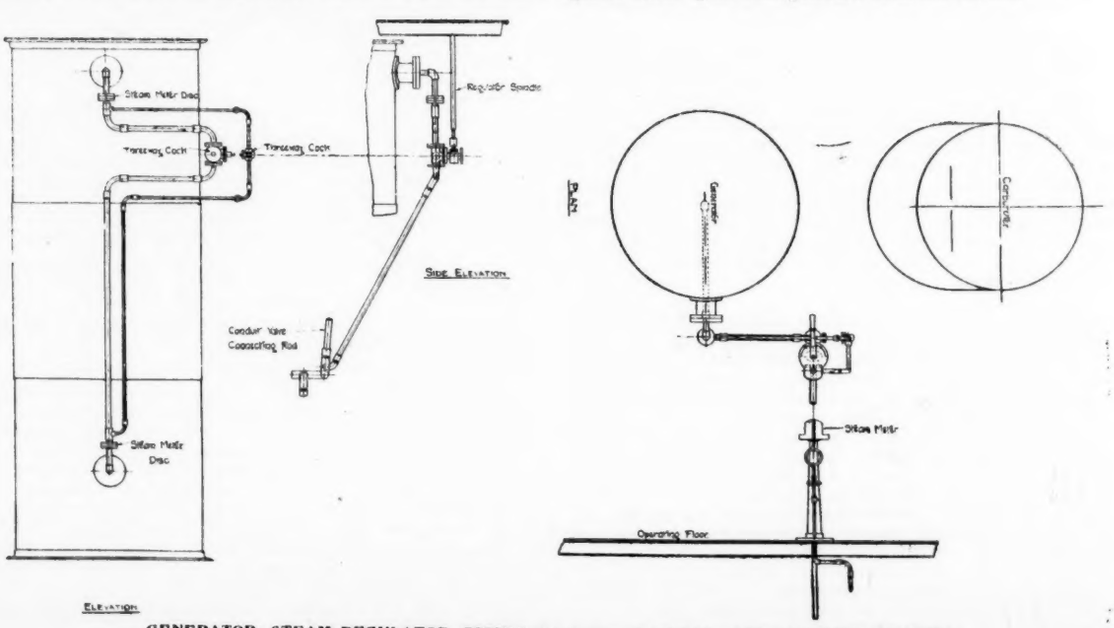
Any member can calculate the saving from the figures given later, according to his local circumstances. The collateral advantages, however, of reducing the yield of coal gas should not be left out of account. Assuming that in the past the retort temperatures have been pushed to the limit to get (say) 13,000 c.ft. per ton, and that it is decided to lower the temperatures and be content with 11,000 c.ft. stretched to 15,000 c.ft. with blue water gas, the yield and quality of tar will improve, also the yield of ammonia; the repairs account will show a reduction, and so will the distribution expenses in dealing with naphthalene deposits.

Before turning to a description of the water-gas plant at Colchester, it should be explained that it was designed for the manufacture of carburetted water gas, although it is more often used in these days to make blue water gas. There is no difficulty in changing-over from one to the other, and it is only necessary to slightly alter the working—in fact, the writer has changed in the middle of a shift from blue to carburetted gas. A sudden heavy demand coming on and reducing the holder stock seriously, it is often necessary to obtain more gas at very short notice. As this would involve increasing the percentage of water gas above our limit for blue gas—viz., 30 p.ct.—it becomes necessary to carburet it to a certain extent. This simply involves fixing the oil-injectors, starting the oil-pump, and raising the carburettor and superheater to the required temperature.

Reconstruction of Water-Gas Plant.

The carburetted water-gas plant at Colchester was erected in 1895, and was naturally old-fashioned in 1914. Although the operators were skilled men, the appliances for controlling the operations were so few that, even with everything in order, good results could not be expected. In any case, the generators were leaky, and the valves worn out; so that when the writer took charge early in 1914 something had to be done without delay. The carbonizing plant was working to its full capacity, and was in a bad condition. At that time capital was not available for new plant; the Company having come to the end of their authorized capital some years before. Having to face an increasing demand, due to pushing the sale of gas, it was decided that the best course would be to increase the capacity of the water-gas plant, as this could be done at a reasonable cost, and at the same time to modernize it, so as to improve the results. The old plant consisted of two sets, each of a capacity of 300,000 c.ft. per day. These were converted to have a guaranteed capacity of 500,000 c.ft. each per day.

The original designers of the old plant cut down the capacity by having the blast-valve and connections, as well as the stack-valve, too small. The capacity could have been increased simply by increasing the areas of these, and thereby getting a certain volume of air through the fire in a shorter period of time. However, as new generators were needed, these were made 6 ft. 6 in. in diameter, in place of 6 ft. All the gas connections right up to the scrubber were also increased in size from 10 in. diameter to 14 in., and a new stack-valve of improved design (15 in. diameter) was fitted to the top of the fixing chamber. The blast main and connections were all increased in size from 10 in. to 14 in., and a new blast valve, 12 in. in diameter, was connected to the new generator. The old carburetter, superheater, and scrubber were not altered, except that larger connections were fitted, including new reversing valves of the dry double-faced pattern. These vessels proved to be of ample capacity for dealing with the increased make of gas, even when 16-candle carburetted water gas was made. A new steam turbo-blowing set, consisting of a Kerr steam turbine coupled direct to a gas-plant blower, was also fixed, and has been in almost constant use ever since; the old belt driven fans having been retained as a standby. The turbine, running at 1400 revolutions per minute, gives a blast pressure of 23 in. water-gauge with the blast-valve to the generator full open, against about 13 in. blast pressure from the old fan.



GENERATOR STEAM-REGULATOR PIPING—MESSRS. DAVISON AND PARTNER, MAKERS.

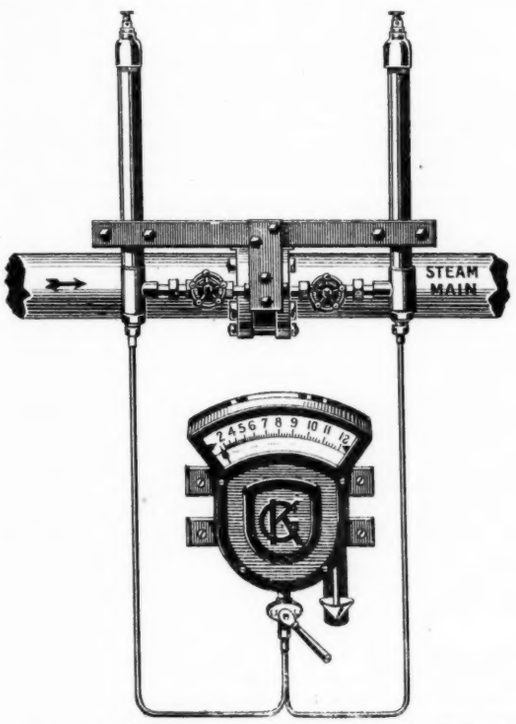
Pyrometers.

Electrical pyrometers were fixed, with thermocouples in both carburettor and superheater, but with only one indicator for each plant; a switch being used so that the temperature at either point could be read by turning the switch to left or right. The range of temperature marked on the galvanometer dial is from 500° to 2000° Fahr. Pressure gauges showing the pressure at various parts of the plant, the blast pressure, and the pressure of oil and steam, were mounted on a board so as to be easily seen by the operator.

Steam and Air Meters.

Each plant was also fitted with meters indicating the supplies of air and steam to the generator. Both of these were made by an English firm—Messrs. George Kent, Ltd.; and the writer attaches special importance to the use of this apparatus.

The air-meter consists simply of a manometer, in which the liquid used is paraffin of a specific gravity of about ·8. The tube of the manometer is curved, so as to obtain an equally spaced scale over the range of flow to be measured. A carefully bored orifice disc is inserted in the blast-main next to the blast-valve of the generator. Pressure pipes from the two sides of this orifice are led to the two connections that are provided on the manometer; and the instrument is calibrated, not in inches of pressure (differential), but so as to read thousands of cubic feet of free



Steam and Air Meter.—Messrs. George Kent, Ltd., Makers.

air per minute. Each instrument is, of course, calibrated for a certain diameter of orifice. The particular manometer in question is calibrated for a pressure of 23 in. of water-gauge above atmospheric pressure, and a temperature of 60° Fahr. If extreme accuracy is desired, a multiplying constant is used to correct the readings of the instruments for variations in the temperature and pressure of the air and in the specific gravity of the manometer liquid.

The original steam-meter installed consisted of a rate of flow indicator connected across a bored orifice plate placed in the steam-main; the orifice plate being introduced into the steam supply pipe next to the control cock of the generator. Steam-pipes ($\frac{1}{4}$ in.) were connected on the up-stream and down-stream sides of the orifice, and run to the instrument on the operating floor. The instrument contained a spring-controlled flexible diaphragm, which actuated the pointer on the scale. The up-stream pressure was connected to one side of the diaphragm and the down-stream pressure to the other; and the pointer indicated on a circular scale pounds of steam per minute at the pressure for which the instrument was calibrated.

There were two objections to this instrument. The connecting pipes had to be kept full of water to prevent the access of live steam to the instrument; and as this was fixed above the steam-pipe, and the plant was not working continuously, it occasionally happened that steam got into the instrument and damaged it. In order to avoid such difficulties, the makers have for some time been supplying an improved instrument in which a magnetic gland is used to preclude the possibility of water draining-out of the instrument.

The second objection is that the instrument is calibrated to show the rate of flow of the steam at a certain pressure; so that if the boiler pressure varies, the readings must be corrected accordingly. The reason for this is that the weight of steam passing depends upon the density—*i.e.*, the pressure—of the steam as well as upon the pressure difference across the orifice. To meet this difficulty, the makers have supplied another form of meter which gives true readings of the weight of steam passing within 2 p.ct. This is extremely simple and very useful and practical. It consists of an ordinary steam pressure-gauge mounted on the stand of the control cock, together with calibrated nozzles on the steam supplies to the generator. The steam-gauge has a special dial showing the pressure in pounds per square inch on the up-stream side of the calibrated nozzles, and also the steam passing in pounds per minute. This pattern of meter has been in use for some time with entirely satisfactory results. It can only be used in such cases as the present one, where a pressure drop of some 30 to 90 lbs. can be allowed across the orifice.

It requires no argument to show the necessity of these appliances if a plant is to be run economically. Obviously, the generator should be supplied with a certain amount of air per blow; and this might be obtained in practice if there were always the same air pressure below the fuel bed, and the resistance of the latter remained constant. As a matter of fact, the resistance of the fire increases until it is at its maximum just before clinkering; and the air pressure, though constant at the blower outlet, varies under the grate according to the varying amount of secondary air taken from the blast main to heat the carburetter and superheater. [Anyone who makes carburetted water gas is aware that the temperature of the oil-cracking chambers is regulated by admitting more or less secondary air to these vessels to consume some of the carbonic oxide which is always present in excess in the blast gases, and that the amount of secondary air so used varies considerably.] Similarly, the amount of steam which the generator can dissociate, if the fire is kept fairly clean and at the right temperature, is a certain quantity. If this is exceeded, the CO_2 in the gas goes up. If, to prevent this, the steam supply be reduced, the production of gas is decreased. It is all very well to use a quadrant cock for the steam, and to set it at a certain mark; but varying steam pressures on the boiler, varying back-pressures on the plant (due to the resistance of the fire and other conditions), render it impossible to work to the best advantage without some means of measuring the steam used.

In addition to the above, the contractors fixed an instrument which they had found useful in practice—viz., a "Dead Beat" S & A Differential Pressure Gauge showing the resistance of the fuel bed during the blow. This stares the operator in the face; and he has ample warning when his fire is getting clinkered over, as the differential pressure then increases.

Our method of working was to find, by testing the quality of the gas and the percentage of CO_2, the best possible working conditions, and then to standardize them—telling the operator the quantity of steam in pounds per minute, the air-blast pressure, the air per minute in cubic feet, the oil pressure, and the temperatures of the carburetter and fixing chamber. Having found the best point, the conditions are adhered to. Although the two generators are identical in design, and have, so far as the writer knows, exactly similar fittings, the steam-gauge on the inlet pipe shows quite different figures on the two plants, and on changing-over we should be fumbling about for days to find the right conditions. The steam and air meters, however, put us right immediately; and having noted all the information, we can always reproduce the conditions and get the same results. We found the highest efficiency with the maximum pressure of air-blast—viz., 23 in.; but the tremendous heat generated at the bottom of the fire fused all the clinker into a solid lump. This made the work of clinkering extremely arduous; so we sacrificed a little efficiency and reduced the blast to 19 in., which gives a clinker that can be handled.

Fuel Depth.

The depth of fuel in the generator is an important factor in the results. In our case, the generator is not so deep as usual; and we have found this an advantage. There is no difficulty, if the fire is kept clean, in making good gas even when the fire is lowest—*i.e.*, just before putting on fresh fuel. And a shallower fire means less waste of heat during the blow.

The guarantees for the remodelled plant were: 29 lbs. of net coke per 1000 c.ft. of gas corrected to normal temperature and pressure, with not more than 4 p.ct. of CO_2; oil consumption, $2\frac{1}{8}$ gallons per 1000 c.ft. of 16-candle gas (No. 2 "Metropolitan" burner); and a production of 500,000 c.ft. of oxide purified gas in 24 hours. These guarantees were carried out without difficulty; and the production has been regularly more than the guaranteed quantity.

Working Figures.

The following are the standardized working figures:

Size of generator	6 ft. 6 in. external dia.
Depth of fuel before adding fresh charge	5 ft.
Do. after adding fresh charge	6 ft. 5 in.
Area of grate	15·9 sq. ft.
Average make per minute	680 c.ft. = 42 c.ft. per square foot of grate per minute
Steam pressure before regulating cock	100 lbs.
Do. after regulating cock	70 to 80 lbs.
Air pressure on blast-main next to generator	19 in.
Air per minute, generator	2300 c.ft.
Speed of blast in generator	289 lineal ft. per min.
Air per 1000 c.ft. of gas made	1350 c.ft.

Steam used per minute, up-runs	19½ lbs.
Do. down-runs	17½ lbs.
Steam used per 1000 c.ft. of gas made, up-runs	29 lbs. weight
Do. down-runs	26 lbs. weight
Cycle	2 min. blow, 5 min. run
Temperature of the carburettor	1370
Do. superheater	1320
Oil-pressure at injector	60 lbs. per sq. in.
Coke used in generator (gross)	32 lbs.
Breeze used in boilers	12 lbs.
Differential pressure during blow top and bottom generator with clean fire	7 in.
Do. with dirty fire	10 in.
Pressures during gas making—	
Generator bottom	14 in.
Generator top	13½ ,,
Carburettor top	13 ,,
Washer outlet	8 ,,
Average H_2S in unpurified blue gas	239 grains per 100 c.ft.
Average CO_2	3·6 p.ct.
Sulphur compounds in blue gas	16 grains per 100 c.ft.
Calorific value of blue gas	300 to 310 B.Th.U.
Mixed coal and blue water gas	70 p.ct. and 30 p.ct.
CO_2	3 p.ct.
Sulphur compounds	26 grains per 100 c.ft.
Naphthalene	Nil
Calorific power	480 to 500 B.Th.U.
Illuminating power—No. 2 "Metropolitan" burner	12 candles

New Condenser.

It was necessary to fix a new water-cooled condenser for the water gas. This has a tube surface of 2246 sq. ft. Water from a high-level works supply goes through the condenser; the cold water entering at the bottom or gas outlet end and overflowing at the top into an overhead storage tank, from which the boilers are supplied with water at about 150° Fahr. This condenser reduces the temperature of the gas to about 80° Fahr.; and there is a considerable amount of condensation in the main leading to the relief holder. The latter is of 90,000 c.ft. capacity; while the plant makes at the rate of 27,000 c.ft. per hour. The small capacity of the relief holder is a drawback when making blue water gas. When adding 30 p.ct. last October, for instance, the amount of water gas required was 200,000 c.ft. per day. This was made (including stops for clinkering) between 6 a.m. and 2 p.m.; and as the relief holder would only contain 90,000 c.ft., the balance of 110,000 c.ft. had to be taken over and mixed with the coal gas at the rate of 14,000 c.ft. per hour—equalling over 50 p.ct. of the mixture during some hours. However, by always working into one large holder and out of the other no trouble was experienced, and a good mixture resulted. The writer, however, very strongly advises anyone adopting water gas to see that the relief holder is of ample size.

The water gas is measured, on leaving the relief holder, in a separate station-meter of the usual type, and can be separately purified or mixed with the coal gas at the inlet of the exhauster. No steps were taken to introduce the water gas into the foul main, as it was felt that any hydrocarbons picked up would only be washed-out again in the tar-washing scrubber. As a rule, the water gas is separately purified, and mixes with the coal gas at the inlet of the large station meter. The generators have a double lining, and the six bottom courses of the inner lining are renewed as a rule in both plants every summer.

Steam Raising.

Dry steam at high pressure is needed for the plant; and the pressure should be as constant as possible. In our case, two boilers burning breeze are used to supply steam to the water-gas plant, the sulphate plant, and the tar dehydrating plant. The breeze burnt, consisting of a mixture of pan breeze and small coke breeze, has on several tests worked out to 12½ lbs. per 1000 c.ft. of gas made. Taking 8 lbs. of water evaporated per pound of fuel, this would be 100 lbs. per 1000 c.ft. made. This will enable anyone to calculate the size of boiler required. Our working pressure is 120 lbs. on the boilers and 100 lbs. at the plant, which is adjacent. The steam is therefore fairly dry. The steam-turbine would be much more efficient if run condensing; but in our case no use is made at present of the heat in the exhaust.

Pumps and Gauges.

Circulating pumps are generally a nuisance, as the hot water from the washer and scrubber attacks the steel very rapidly. Simple slow-stroke pumps of ample capacity, and in duplicate, are essential; and a reserve supply of water at a good pressure for maintaining the seal in the washer in case of the stoppage of the pump is very useful. The oil pumps should also be in duplicate, and should have metal valves and pistons, as the oil soon disintegrates canvas preparations.

It has been found that the best place for the oil-pressure gauge is close up to the injector, as this will show at once if there is any leak on the latter. Naturally, if oil leaks out of the joints and runs down the carburetter lining, most of it is not vaporized but converted into carbon; and a high pressure at the injector, with small holes so as to produce a fine mist, are essential to good oil results. It is of little use to have a pressure-gauge on the inlet side of the regulating cock. The injector holes become enlarged, or the joints leak, and the operator partly closes the cock to get a certain quantity of oil injected each run. The pressure-gauge on the oil-meter may show 100 lbs.; but the effective injector pressure may not be 20 lbs.

Need for Carburetting.

It seems odd to be discussing oil results now, as most engineers have hardly used any for two years; but it is found that, as a matter of practice, its use can hardly be dispensed with altogether. Although the writer's practice since the early months of 1917 has been to maintain as far as possible a uniform mixture of coal and blue water gas, there are occasions (particularly in the depth of winter) when it is essential to produce more gas at short notice. At such times the percentage of water gas may be increased to 50. But this, of course, has to be carburetted. During the recent coal shortage, the stock of gas-oil proved invaluable; and 50 p.ct. of water gas carburetted with about a gallon of oil per 1000 c.ft. was used for several months. The change in the composition of the gas was not noticed; and no complaints were received. Experience shows that, provided the calorific power is maintained fairly constant, the composition of the mixture may vary within wide limits, provided the inerts are kept low.

It may be of interest to state that the calorific value of the oil gas produced is about 100 B.Th.U. per gallon per 1000 c.ft. Working to this figure, it is easy to calculate how much oil must be used to make carburetted water gas of any desired calorific value. With regard to the mixture, a proportion sum shows what the calorific power would be. The usual calculation is as follows:

	B.Th.U.
70 c.ft. of coal gas at 600 B.Th.U.	42,000
30 c.ft. of water gas at 300 B.Th.U.	9,000
100 c.ft. of mixture	51,000

Calorific value of mixture containing 30 p.ct. of blue water gas = 510 B.Th.U. per c.ft.

The Question of Cost.

A few figures as to cost may be of interest; but, of course, capital cost figures of by-gone years are of no use at present. Therefore capital charges are omitted. The cost of the reconstruction, including all the instruments, was £1750 for the two plants. The cost of manufacture last year was as follows:

	Cost per 1000 c.ft.
Coke generator, 32 lbs. at 36s. per ton	6·18d.
Breeze boilers, 12 lbs. at 10s. per ton	0·64
Labour (generating and running repairs)	2·23
Mechanics' and bricklayers' repairs	0·62
Purification (labour only)	0·19
	9·86d.

The cost of coal gas into the holder, not including rates and taxes, was 2s. 3d.

It should be added that the plant as a rule is only worked in the daytime; but in the depth of winter, two shifts are necessary. The relief holder is always left full at the end of the day's work, and is emptied during the night. Although better fuel results would be obtained by working the plant continuously, there are decided advantages in having apparatus large enough to make all the gas required in one shift, especially in a medium-sized works. For instance, one boiler man raises steam for the plant and for the sulphate and tar plants; and one operator works the plant. If two shifts were worked, obviously the labour charges would be nearly doubled.

Water-Gas and Meter Life.

In the report of the Life of Gas-Meters Research Committee, presented to the Institution of Gas Engineers last October, the following statement occurs: "Sulphur dioxide is always present in blue (uncarburetted) water gas. . . . Unless some special means be taken to absorb the sulphur dioxide (such as passing through slaked lime, soda ash, or ammoniacal liquor, or by reacting with sulphuretted hydrogen), it may make its appearance on the district." The deleterious action of this impurity on meters is referred to in the report at considerable length. This is a very interesting question; and now that the danger is pointed out, it is not difficult to avoid. Of course, carburetting the gas, even slightly, disposes of the difficulty at once; but one does not wish to sacrifice any part of the economy of the process by expending money on oil enrichment. Obviously no difficulty will arise if the blue water gas is mixed with the coal gas before the scrubbers, as the ammonia in the latter will neutralize the sulphur dioxide. As this is the plan most likely to be favoured by those adopting the process now, there need be no fear of possible evil consequences as regards the meters on the district.

At Colchester, owing to lack of purifying capacity, it has been the practice to pass the water gas through separate purifiers containing oxide of iron only. Tests made at the outlet of these purifiers showed an average of 16 grains of sulphur per 100 c.ft.; while tests at the inlet showed 37 grains. In both cases the gas was free from sulphuretted hydrogen; a small purifier being used on the inlet gas to remove this impurity. It therefore appears that the purifiers, in addition to removing the whole of the H_2S, had taken out 21 grains of sulphur compounds—presumably SO_2. It should be added that no ammonia enters these purifiers, and no lime or caustic is added to the oxide, which is natural Westbury oxide mixed with sawdust. It would be safer perhaps to mix lime or caustic with the oxide, as is done in preparing the artificial material; but the difficulty in keeping the stuff alkaline is already sufficiently great in purification, and one does not welcome the addition of quantities of an acid gas like SO_2, which might upset the extraction of SH_2 at any time by rendering the oxide acid. It therefore seems far better to mix the water gas

and coal gas before the scrubbing plant; and the writer, having installed some new purifiers, is now doing this.

It would be interesting to have the experience of members who make blue water gas on the various details referred to. The practice with regard to down-runs varies considerably. At Colchester, it is the rule to work one down-run in five, whether making blue or carburetted gas. It would appear that it would be profitable to make more down-run when producing blue gas in order to cool the top of the fire and reduce the carbonic oxide in the blow gases. However, when this was tried, the fuel results were very little better, and the make of gas per run fell off seriously. In this, as in many other matters, the "local conditions" always have the last word.

CALORIFIC BALANCE.

When everything possible has been done to carefully adjust the conditions of operation, there is still considerable waste of heat during the blow. Different estimates of the amount of this loss have been made by various writers; and it may be of interest to give calculations based on analysis of the blast products and on the quantity of air passed through the generator, as shown by the air-meter. An average of three analyses during the blow when making blue water gas showed 11·1 p.ct. of CO_2 and 7·3 p.ct. of CO in the blast gases leaving the generator. It is calculated that the heat carried away at the stack under these conditions amounts to 80,106 B.Th.U. per 1000 c.ft. of water gas made. If it were possible to obtain ideal conditions, and to eliminate the CO, the loss would be reduced to about half this amount. One use for the waste heat which naturally suggests itself is for the raising of steam for the plant in a gas-fired boiler. Unfortunately, the heat available is not sufficient for the purpose.

Assuming that the boiler feed water is raised to 212° Fahr. by means of the heat in the water gas produced and the exhaust steam from the turbine, and taking the actual figures as to steam required for the plant at Colchester—viz., 100 lbs. per 1000 c.ft. —the heat required in the boiler is 127,800 B.Th.U., assuming 80 p.ct. boiler efficiency. It therefore appears that with 7·3 p.ct. of CO in the blast gases the heat available is only 63 p.ct. of the amount required, and with CO absent only 28 p.ct. It would, however, be possible to raise part of the steam required in this manner in a gas-fired boiler, which could be fitted with an automatic feed-water control valve, thereby dispensing almost entirely with labour for boiler firing as well as saving solid fuel.

It is hoped that these somewhat discursive notes may be of some use to two classes of members—those who already have water-gas plants and can compare the figures with their own experience, and those who are considering various methods of increasing their producing plant and at the same time reducing their working costs. In this connection, it may be pointed out that steaming the charges in horizontals or inclines does not increase, but reduces, the producing power of the works. Moreover, a retort-setting is a costly thing, and should be used for carbonizing. If water gas is required, a separate producer designed for the purpose seems to be the proper plant for making it.

DISCUSSION.

The PRESIDENT (Mr. H. R. Wimhurst) said they had listened to a most interesting and instructive paper, and were extremely obliged to Mr. Townsend for having brought the question forward. The production of water gas was now quite a topical subject. They were all exercising their minds as to how best they could increase the B.Th.U. product per ton of coal; and Mr. Townsend had shown one way of doing it. They had been wondering how it was Mr. Townsend had been able to get through the strenuous war period with only a three-penny increase in the price of gas. Now they knew. [Laughter.] The information he had given them in the paper showed how it was done. He, for one, not possessing a water-gas plant, rather envied him the excellent results he had been able to obtain.

Mr. W. B. FARQUHAR (Ilford) endorsed the remarks of the author as to the value of a water-gas plant. His opinion was that, in any moderate-sized works, a carburetted water-gas plant was a necessity. The whole question, boiled down, was to-day as to the make of gas and the cost by such plant compared with steaming the charges in retorts. They wanted to go very deeply and carefully into that. He noticed Mr. Townsend's make of coal gas was 10,700 c.ft. per ton of coal. This was a low make indeed, and to get the amount of coal gas required for the daily demand probably meant putting on one or two more beds of retorts. The additional beds wanted with such a low make would vary according to the size of the works and the consumption of gas. He was lately discussing vertical retorts with a manager who had a large installation, and was steaming. He asked him whether in steaming he had to reduce the throughput of coal. He replied that he had the same throughput when steaming as when making coal gas only. This really meant that he was getting, as a matter of fact, an extra make of gas with steaming from each retort, which represented a capital saving. One advantage of having a carburetted water-gas plant was that in times of stress one could put on the oil and make a better quality of gas. A little more could then also be put on to the make of coal gas per ton of coal, so a higher amount was obtained out of the retort-settings, and a higher total production realized than when resort could not be had to carburetted water gas. Another point was this, that if one had a water-gas generating plant only, and had no steaming with vertical retorts, the water-gas plant would have to be run summer and winter; whereas if there was a possibility of being able to shut-down the carburetted set during the summer months, and keep the water-gas plant as a stand-by for the winter months, there were advantages. There was then not only the saving of the wages of the operators of the plant, but the wear and tear. The author of the paper had also mentioned the trouble of clinkering, which at the present time was very severe. If in summer, they could by steaming make up the amount of gas wanted, they got over the clinkering in the water-gas plant. He had touched upon the fact that the carburetted plant was very useful for emergency purposes. In his own particular instance, he used to meet the November fogs in London on the water-gas plant very easily; and so a water-gas plant was an essential thing for them to have. As to the purifier problem, and oxide getting acid, there was always an opportunity of bye-passing a little ammonia through to keep the oxide alkaline. He had pleasure in proposing a vote of thanks to Mr. Townsend for his paper.

Mr. FRANK PRENTICE (Ipswich) said, though there were numerous points in the paper which could well occupy attention, he would confine himself to one. Mr. Townsend's make of coal gas per ton was only 10,700 c.ft., to which he put 4500 c.ft. of blue water gas, making a total of 15,200 c.ft. This water gas should not contain any oil. There was an alternative way of working. This was to increase the make per ton of coal up to 13,000 or 14,000 c.ft., and afterwards add 5000 c.ft. of water gas, which would make a total of (say) 19,000 c.ft. per ton. They would at once say, What about the quality? He would admit that the calorific value would not be so high as that produced at Colchester. This, however, could be remedied by a gallon of oil, which at the present time cost 8½d. By the expenditure of this 8½d., Mr. Townsend would produce a further 3800 c.ft. per ton of coal used. Thus he would be making a very good bargain. His second object in rising was to second the vote of thanks to Mr. Townsend. He always looked on him as one of the coming men in the industry. It was his privilege to visit Mr. Townsend's works some time ago. He showed him nearly all that was going on there; and he was bound to say that the amount of ingenuity and skill which he had exhibited in obtaining a better duty out of works which were old and out-of-date was very remarkable. Mr. Townsend went to Colchester finding everything in a bad way; but to-day all over the works they saw the signs of the master hand.

Mr. A. W. SUMNER (Grays) said Mr. Townsend referred to a make of 15,200 c.ft. per ton of coal; but he did not bring the fact prominently to notice that this meant he was consuming more coke than if he was making 15,000 c.ft. from his retorts only. Mr. Townsend talked about 32 lbs. of coke (gas) per 1000 c.ft. of gas made. It was, however, only fair in making this calculation that a certain amount of coke for the boiler should be included. For boiler and generator, in his own case the coke consumption came to 60 to 66 lbs., especially with the class of coke obtained from their coal at the present time. Reference was made to the cost of making water gas night and day. It seemed to him that it was only a question of cost per 1000 c.ft.; and that it did not matter much whether it was produced day or night. If they were paying more to labour for raising steam and working the plant, they were making gas, which came out to so much per 1000 c.ft. He had vertical retorts at Grays; and with them since July 1 last up to the present time, he had continued to make 17,400 c.ft. of gas per ton, including steaming. It seemed to him that, if they could make this quantity of gas from their retorts without having to use water gas, it was just as well to do it. In addition, he had blue water gas plant. It seemed to him that what they had to do was to satisfy their consumers. He might say that they did not have anything like the complaints it might be imagined they would have out of 9000 consumers. The total complaints of all sorts—such as leakages and defective fittings and burners (they had had a little firing-back of the burners at cookers, which was easily rectified)—amounted to about eighty per week; so that sending out low-grade gas made by vertical retorts, steaming, and adding blue water gas, was a good proposition; and they might go forward with it. He urged in conclusion that all the coke used in these processes should be calculated-out, so that they would know exactly what a ton of coal yielded for sale both in gas and coke. If they did not include all the coke used, it was unfair to speak of so much gas being produced per ton of coal.

Mr. E. F. KEABLE (Southtown, Yarmouth) said he thought the explanation of Mr. Townsend's good results was the fact that he had used scientific methods all round; and if all who were working water-gas plants were to realize the same results as he was getting, they would have to instal the same instruments for measurement.

Mr. W. H. MAINWARING (Lincoln) said their carburetted water gas plant had been established for nearly twenty years; but their figures were not so good as those of Mr. Townsend, because they had not the instruments—they had not the steam and air meters, although they were things he should try to get as soon as possible. It seemed to him that to obtain consistently good results they must measure the air and steam. During the twenty years they had had their plant, its usefulness had been demonstrated over and over again in many ways. In war time there was a period during which they were asked to discontinue the use of the plant, and they only made gas during two or three winter months. This was a year or two ago, and last winter they only made about 20 p.ct. In their case they had two works connected to the same system of mains. They were not able to pull the quality down beyond this amount of blue water gas, as there was a point in the district where the gases met; and it might have caused trouble to an unpleasant extent. He was making about 11,500 c.ft. of gas per ton of coal, and putting in water gas carburetted with a third or half gallon of oil. They supplied gas of 530 B.Th.U. gross. They had no more complaints than they formerly had with coal gas. By the use of water gas, he estimated they had saved no less than 3500 tons of coal during the past season. Without this saving, they would have been absolutely lost so far as coal gas was concerned. There was no doubt that the gas industry as a whole had to thank water gas for having kept it going to the extent it had done. There was another point with regard to the future. Every possible step would have had to be taken to save labour; and water-gas plant was cheaper than coal-gas plant from the labour point of view. Their coal gas cost them 1s. 9d. into the holder; and the mixture of coal and water gas cost about 3d. or 4d. less, with half-a-gallon of oil per 1000 c ft.

Mr. J. W. AUCHTERLONIE (Cambridge) said that, until very recently, they were not very keen about installing a water-gas plant; but two of the points Mr. Townsend had touched upon—the labour question and uncertain deliveries of coal—induced his Company to put down a plant of only 500,000 c.ft. capacity. He was exceedingly satisfied with

the results, though it was more or less a temporary thing. He did not put in any special purification plant; and the blue water gas mixed with the stream of coal gas, and so went through the whole purification system. Unfortunately, the meter which measured the crude water gas was very unreliable. But actually he was making about 14,000 to 15,000 c.ft. per ton of coal. It had been remarked that Mr. Townsend ought to make more than 10,700 c.ft. of coal gas. In his (Mr. Auchterlonie's) own case, they had dropped down from a little over 12,000 c.ft. to 11,600 c.ft.—presumably from the same coal. An examination, however, of a sample of the coal showed that it contained a good percentage of stone and useless material from which gas could not be made.

Mr. C. B. Tully (invited by the President) said that Mr. Townsend must be congratulated upon his useful paper; and he endorsed everything in it. He himself was working on rather different lines. Instead of ordinary carburetting, he preferred to use a non-caking coal or cannel for carburetting purposes. At the present time, by his system, they were sending out 400 B.Th.U. gas made from coal and coke, or coal and turf, or anything that would make gas. There was no doubt this had been a saving to some of the smaller companies; it had been the means of making a profit where there had been a loss before. At Kingscliffe they had supplied the village with 400 B.Th.U. gas, and for the past twelve months, or thereabouts, they had been running the village on blue water gas of 300 B.Th.U. They had had no complaints during that time. They had in fact sent out gas as low as 200 B.Th.U. Then they had a few complaints, but very few indeed. He could assure the members that gas of 300 B.Th.U. could be sent out with as great satisfaction as coal gas. He hoped within three months to be running a 7 or 8 million cubic feet works on this gas. It was a question of closing-up these works, or doing something else to save the concern. Such small works had not the capital to expend. They were on the rocks; and it was a question of providing them with capital. Negotiations were pending with bankers in London to finance certain small companies, so that they could get this plant.

Mr. S. Moore (Scunthorpe) said that last December at Scunthorpe they could not get sufficient coal; and when he said that a few years ago they were sending out less than 20 million cubic feet of gas, and now 80 millions from the same works, the difficulty would be appreciated. It was a district of mushroom growth. There were some 4000 new dwellings in it; and they had plans out now for new gas-works. They had, however, to look out immediately for something to help them through. They had adopted a low-grade gas, which had given far more satisfaction than the straight coal gas did formerly. This was only during the last six months. They were absolutely short of coal for at least eleven months; and they never had more than three days' supply in stock. And when they came to the winter they were on the rocks. All that could be done was to make up with water gas. It might surprise some of the members to know that during December they sent out about 9 million cubic feet of gas of about 420 B.Th.U. The make was over 28,000 c.ft. per ton of coal used, or nearly 12,000,000 B.Th.U.—the exact figure being 11,813,286 B.Th.U. After supplying the producers in the coal-gas plant, and the generator in the water-gas plant, they had 6⅛ cwt. of coke per ton of coal for sale during the whole of December. These results were remarkable for old-fashioned hand-stoked ordinary retorts, with blue water gas uncarburetted. As to the question of clinkering, they had the same difficulty as had been described. He found that in generating blue water gas, they had to keep down the CO content as much as possible. It was a bogey with some people. The greater the heat in the generator, the lower the CO content, and the higher the other constituents, even hydrogen. He kept up his heat all he could in his generators; and he had increased his blast, instead of reducing it. He found at the beginning exactly the same thing in regard to clinkering. Then it occurred to him that, instead of taking two hours' clinkering twice a day on a twenty-four hours' run, if he shut down, and steamed for half-an-hour, this would turn the hard rocky substance into rotten stone—simply by steaming beforehand and clinkering afterwards. He agreed with the remarks made as to the usefulness of scientific apparatus for maintaining efficiency. As to inerts, they were supplying works which had laboratories of their own; and they tested the gas. Since adopting the system of sending out mixed gas, they had had congratulations from the steel and other works of the good gas they were supplying. They found they were now getting 89 p.ct. of combustible gas, as compared with 63 p.ct. when coal gas only was supplied, and there was an amount of over-pulling. The total inerts in the mixture never exceeded 11·08 p.ct., and sometimes dropped to 7 p.ct. They aimed at a mixture 40 p.ct. of which was water gas. It was never below; often above. He strongly recommended members using horizontal retorts to introduce the mixture. As to the point at which the water gas should be introduced, he ran the water-gas pipe along the top of the retort-beds, which heated up the water gas. It entered at the far end of the foul main; and unquestionably the hot water gas going in there hotter than the tar and liquor, it separated the ammonia out of the tar, and the tar was almost dehydrated. They had a large quantity of ammonia; and some of the hydrocarbons were absorbed.

Mr. Townsend, replying to the discussion, thanked the speakers, particularly Mr. Prentice, for all their kind and complimentary remarks with regard to the paper, and to himself. Of course, the principal point in the paper was the use of instruments in order to obtain the basic figures on which to work. The lack of these often caused waste of a lot of ink in calculations which were purely theoretical. In the last part of the paper, he had worked-out the heat-balance on the figures as to air and steam used based on actual experiments. If anyone who was interested would compare these with the calculations of other writers, they would find that there were some very extraordinary differences. The President referred to the fact that they had only increased the price of gas during the war from 3s. to 3s. 3d.; and he thought the paper gave the explanation. It was true, as stated in the paper, that they had derived considerable assistance from the use of blue water gas; but this had not been the only favourable factor in their case. He was pleased to note that Mr. Farquhar considered a carburetted water gas plant a necessity in every moderate sized works; and he (Mr. Townsend) emphasized the carburetted, because he thought it was a pity not to make provision for the use of oil or some other enricher when installing the plant. This had a bearing on Mr. Prentice's remarks; and he quite admitted that there were instances where it was better policy to go in for a bigger make of coal gas per ton, and to use a small quantity of oil to bring the quality to the desired level. His make of coal gas per ton had been criticized; but it should be understood that he had simply stated what had been their practice without necessarily recommending it to everyone else. They had obtained the greatest possible make of coal gas with low inerts that was possible under their conditions; and when he pointed out that they had old-fashioned direct-fired hand-charged retorts in use, the members would understand that it was not possible to get a high make of straight coal gas. They were now putting in an up-to-date horizontal installation; and no doubt with this they would work in a different way. The gist of the matter appeared to him to be this: That whatever system was adopted, it should allow of the dilution of good quality coal gas with water gas in any desired proportions, and that the latter should, if necessary, be enriched as occasion required with gas oil, creosote oil, coal tar, or as in Mr. Tully's process by the use of cannel coal in the generator. He could not understand Mr. Farquhar's statement, which he understood was to the effect that the throughput of coal per retort was not affected by steaming. This was not in accordance with what he (Mr. Townsend) had heard on the subject. With regard to Mr. Sumner's remarks, he congratulated him on the results he had obtained with verticals. If he would read the tables given in the paper, he would find that the breeze required for the boilers was given as 12 lbs. per 1000 c.ft., and, adding the 32 lbs. of coke that was used in the generator, the total fuel used was 44 lbs. per 1000 c.ft., against the 60 lbs. estimated by Mr. Sumner in his own case. This appeared to him (Mr. Townsend) to be an argument in favour of the scientific control he was advocating. Mr. Sumner argued that the size of the plant did not affect the cost of making water gas per 1000 c.ft.. His (Mr. Townsend's) reply to this was that the man had to be paid for an eight-hour shift whether he made 10,000 or 100,000 c.ft., and that (within limits) it obviously reduced the cost if all the gas required could be made in one eight-hour shift instead of two, or in two instead of three. One of the speakers certainly pointed to one of the advantages of having vertical retorts when he said that he could shut-down altogether the water-gas plant during the summer. He fully admitted that this was an advantage: but he would point out that as against this the saleable coke produced by a horizontal plant would be greater, and would in his opinion more than make up for the extra labour charges due to working two separate plants. Apart from this, regularity of quality both winter and summer was worth something. Mr Sumner steamed his verticals, and also added blue water gas. Why not make all the water gas required in one plant, and that a plant which was designed specially for the purpose? In order to get a true comparison, they wanted not only the gas made in the different methods of working, but the large saleable coke (not breeze) actually available for sale in every case; and to be perfectly fair they ought also to know the comparative prices. He was pleased to hear Mr. Mainwaring's remarks, and to note that his experience so far as he had gone in using lightly carburetted water gas had been favourable, and that he could produce the mixed gas at about 4d. per 1000 c.ft. less than the coal gas alone. He was pleased to hail Mr. Auchterlonie as a convert, because he believed, until the logic of events, and particularly the coal shortage, changed his views, he was a believer in straight coal gas. He was glad to hear that he was satisfied with the plant he had put down. He thought they had all been greatly interested in hearing the remarks by Mr. Tully and Mr. Moore, of Scunthorpe. There was nothing he need say on these, except that, if anyone wanted to make 20,000 or 30,000 c.ft. per ton, there were other ways of doing it than by steaming vertical retorts. He again thanked the members for the kind way the paper had been received; and he was pleased that it had resulted in producing such an excellent discussion.

AMMONIUM NITRATE AS AN EXPLOSIVE.

Taking the quantity of coal coked in the United States, Mr. C. G. Atwater, writing in the "Gas Age" [New York], estimates the net tons of ammonia produced in sulphate equivalent at 365,000 in 1917, 450,000 in 1918, and for the current year 500,000. For 1915, the figure was 250,049 tons, so that there has been an increase of practically 100 p.ct. in four years. Germany in 1913 reached an even higher figure of 548,558 tons sulphur equivalent. But the whole of the production was not from coke-ovens, some having come from synthetic sources. Mr. Atwater explains that the need for ammonia arose not only from the increased demands in the manufacture of chemicals, soda ash, refrigeration, and agriculture, due to war requirements, but to the unexpected demand for ammonium nitrate as an explosive, which demand became apparent soon after the United States entered the struggle. In November, 1917, it was authoritatively stated that the mobile artillery alone for the new army of a million men would require at least 22 million gallons of toluol before September, 1918. The whole available capacity of the existing bye-product ovens (about 11 million gallons a year) was under contract to the munitions plants supplying America's Allies. The only remaining source of toluol was the gas works, from which it was estimated that about 7 million gallons per annum might be obtained, after waiting for the installation of the necessary plant. These facts made it necessary to have recourse to ammonium nitrate, which can be used very effectively to replace 60 to 75 p.ct. of the "T.N.T." required to load a shell or mine. The method of obtaining the ammonium nitrate was to combine bye-product ammonia with nitric acid obtained from Chilean nitrate. A process was successfully developed by which sulphate of ammonia from the direct recovery plants could be readily used for the purpose.

MIDLAND JUNIOR GAS ASSOCIATION.

Annual General Meeting.

The Annual General Meeting of the Association was held at the Council House, Birmingham, on Thursday last—Mr. T. H. POULSON, of Stafford, presiding. There was a fairly large attendance of members.

Mr. H. W. DEAN (Hon. Secretary) read the report of the Council. It stated that, despite the absence of many of the younger members, to whose virility the Association must look for its advancement, the session had been of an interesting and fairly extensive character. Of the members, 47 were with the forces in the autumn of 1918; but 22 had now returned to their civil occupations. They hoped the return of the remainder would not be long delayed. The membership had increased from 168, at the commencement of the session, to 183.

The report was approved on the motion of Mr. G. M. LEWIS, seconded by Mr. R. J. ROGERS.

In making a number of recommendations, the Council expressed the view that the Association could be made to play a still more useful *rôle* in the technical life of the members. They suggested that papers should be given more frequently; that some of the evenings should be devoted to discussion, paperettes, &c.; that to encourage volunteers a prize scheme for the best papers could be inaugurated, open to members only; that more visits to works should be arranged, with evening visits in the summer time; that a start might be made with a circulating library of technical books connected with the gas industry; and that the formation of an Appointments Bureau might be considered.

The recommendations were submitted for consideration by Mr. T. F. E. RHEAD, who warmly commended the proposal to establish a circulating library.

Mr. B. J. BELL urged that it was a matter for satisfaction that the Council felt that the reporting of papers in the Technical Press should be optional. The reporting of contributions often had a retarding influence. Besides, many of the subjects dealt with by a junior organization were not of general interest. He suggested that a development of the Gas Department technical library in Birmingham might be of even greater value than a circulating library for the Association.

Mr. ROGERS took the view that many of the published papers from the Junior Associations were most valuable to the gas industry. On the other hand there were several types of papers which might well be omitted from publication. He was not satisfied that the multiplication of meetings would conduce to larger attendances; neither did he approve of the suggestion to give a prize for the best paper. There would be difficulty in judging, owing to the diverse character of the papers.

Mr. DEAN expressed the view that a prize scheme would serve as a stimulus to the younger members to contribute papers.

Mr. W. BATT favoured the plan for encouraging the giving of paperettes.

The proposal to form an Appointments Bureau was criticized; the idea being that it was scarcely the function of the Association to give information, or to extend influence, in relation to the filling of vacant positions.

Mr. RHEAD, in reply, urged that a greater variety of papers would make a stronger appeal. The author of a paper should determine whether he was willing that his contribution should be published. If the matter were left open, then the Council could determine it. The circulating library would be largely a postal scheme.

The recommendation in favour of the establishment of a prize scheme for the best paper contributed was deferred. The proposal for the establishment of a circulating technical library was agreed to. A resolution in opposition to the formation of an Appointments Bureau was carried. The other recommendations of the Council in relation to papers were passed.

The election of Mr. W. Batt as the Junior Vice-President was announced; and the retiring officers were heartily thanked for their services.

Mr. C. Carrington Barber, Works Engineer, Saltley, was appointed President; and Mr. H. W. Dean and Mr. T. F. E. Rhead were re-elected Hon. Secretary and Hon. Treasurer respectively.

MANUFACTURE OF GAS FROM WOOD.

Swedish Experiments and Industrial Practice.

A further paper on the manufacture of wood gas is published by the "Journal des Usines à Gaz," from which the translation of the report by Dr. Ott, given *ante* p. 83, was made. The later contribution is one by M. Adolphe Molin, describing the experience at the Stockholm Gas-Works in the distillation of wood. Compelled by the circumstances of the war to employ this raw material, a Committee of Swedish gas engineers first of all carried out experiments with a view to ascertaining the practical results on the industrial scale which could be obtained by the distillation of wood in inclined retorts. Their conclusions, which have been confirmed in practice, are that this form of carbonization plant is very suited to the distillation of wood; that very little change in the furnaces is necessary; and that the daily production of wood gas from each retort is 360 cb.m., as compared with 388 cb.m. of coal gas, although the calorific power is considerably less in the former case.

The Swedish experimenters were chiefly concerned in ascertaining the effect of passing the gas immediately on its production from the wood over a layer of incandescent carbon for the purpose of bringing about the conversion of carbon dioxide into carbon monoxide, as discussed by Dr. Ott. For this purpose logs of wood about 3 ft. in length were introduced into the upper part of the retort. During carbonization, the wood charcoal produced forms in the lower part of the retort, and is replaced by a fresh lot on the completion of the carbonization of the charge in the upper portion. The gas is taken off by a rising pipe attached to the head of the lower part of the retort so that the gaseous products of carbonization are caused to traverse the stratum of incandescent carbon shown in fig. 1. The tests were made with

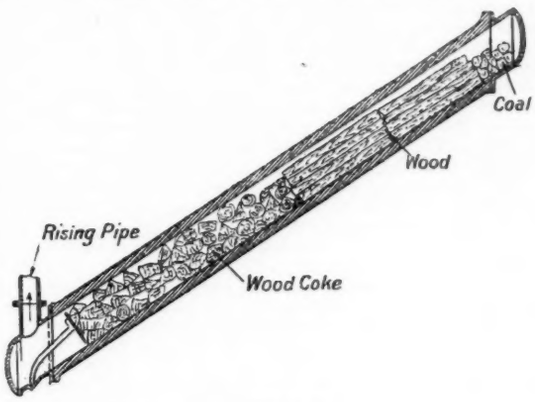


Fig. 1.

one of nine retorts installed on the Coze system. The dipping tube of the rising pipe was removed so as to cut off connection with the hydraulic main; the pipe being then connected to a temporary hydraulic main, and next to a condenser, the gas passing through a meter into a gasholder. The installation did not comprise an exhauster. Into each retort at the upper portion was placed a small amount of coal—about 10 p.ct. of the weight of the wood. This was done in order to provide a sufficient carbon deposit on the walls of the retort to overcome their porosity, and at the same time to yield sufficient ammonia to neutralize the acetic acid from the wood. It was found that this sufficed for both purposes.

In making the experiments, a charge (consisting of 50 kilos. of wood) was introduced into the retort every two hours when employing the lower layer of incandescent carbon, or every three hours when the latter was not used. In the former case, it was not necessary to complete carbonization with the charge in the upper part, inasmuch as the process is carried to completion on the charge in a highly carbonized state passing into the lower portion. The temperature of the furnace averaged 1200° C., and the results obtained were as follows:

—	Carbonized with Carbon Layer in Retort.			Carbonized without Carbon Layer.
Moisture in wood, per cent.	16	25	35	19
Duration of test, hours	72	48	72	24
Yield from wood (moist), cb.m. per 100 cb.m.	717	658	610	378
Yield from wood (dry), cb.m. per 100 cb.m.	854	877	938	465
Coal gas in mixed gas, per cent.	4·2	..	5·2	..
Density (measured) of gas	·58	·63	·60	·65
Density (calculated) of gas	·55	·61	·60	·65
Gross calorific power of mixed gas, calories	3390	..	3100	..
Net calorific power of mixed gas, calories	3890	..	2820	..
Gross calorific power of wood gas, calories	3310	3050	2990	3550
Calorific power of wood gas calculated on 1 kilo. dry wood, calories	2828	2675	2805	1651
Calorific power of gas compared to that of dry wood (4952 calories), per cent.	58	54	57	34
Composition of the Gas.				
Carbon dioxide	11·4	14·2	16·0	15·8
Heavy hydrocarbons	1·9	1·2	1·8	2·1
Oxygen	1·8	2·1	1·3	1·3
Carbon monoxide	21·9	26 1	21·8	23·6
Methane	14·9	8·2	9·1	14·5
Hydrogen	46·5	44·5	47·1	39 2
Nitrogen	1·6	3·7	2·9	3·5
Dry wood charcoal per 100 parts of moist wood	23	1 8	16	19

It is seen from these figures that the yield of wood gas decreases

as the proportion of moisture in the wood increases. It is to be noted, however, that with an increase of moisture the yield calculated on the basis of the dry wood increases as a result of secondary reactions. In the absence of the reducing layer of carbon in the retort the yield of gas falls off considerably and may be only half the yield obtained when this layer is employed. In the table, the proportion of coal gas in the mixture of gases produced is calculated on the basis that the tonne of coal produces 310 cb.m. at 15° C., and 760 mm. The tests with wood containing 25 p.ct. of moisture were made without the addition of any coal to the retort, for the purpose of obtaining a pure wood gas. In carbonization done without the use of the reducing layer, it was not possible to add the coal, since the time of distillation was not sufficient for the carbonization of the more solid fuel. The density of the gas is about ·60; but it becomes a little higher when the reducing layer of carbon is dispensed with.

In making the addition of coal as described above, the calorific power of the quantity of coal gas produced (5100 calories per cb.m.) was subtracted from the figure for calorific power found by measurement, and that for the wood gas alone thus computed. It is seen that the calorific power of wood gas increases in inverse measure to the proportion of moisture in the wood. When carbonizing without the use of a reducing layer, the calorific power is not appreciably higher than when employing this device for higher yield. From the calorific power of the wood gas and from the yield in gas (from dry wood), the number of calories contained in the gas obtained from each kilo. of dry wood can be calculated. If this figure is expressed relatively to the calorific power of 1 kilo. of wood (4912 calories) a number is obtained—it may be called the degree of thermal activity—which is practically constant for the three tests made with a reducing layer of carbon, but is considerably less (only half) when the layer is dispensed with.

The content of carbon dioxide in the gas is more than 16 p.ct. in three cases and nearly 16 p.ct. in the fourth, although the proportion of moisture is much less—only 19 p.ct. When a reducing layer of carbon in the retort was employed in conjunction with wood containing only 16 p.ct. of moisture, the carbon dioxide was as low as 11 p.ct.

In order to study the reducing action of the layer of wood charcoal in the retort, measurements were made during the process of distillation, without the addition of coal, of the density of the gas. The curve in fig. 2 shows that during the first half hour

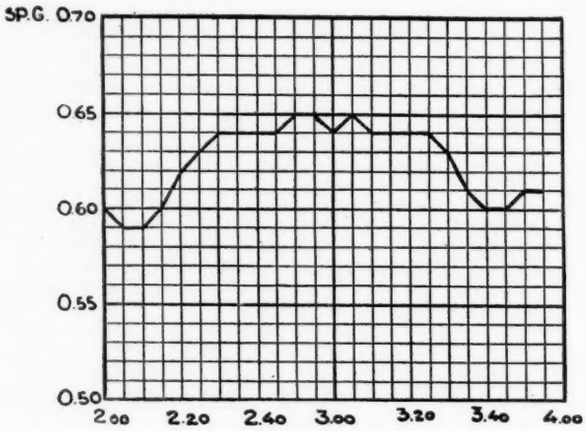


Fig. 2.

the gas produced is of progressively greater density, remains constant for about an hour, and then falls to very nearly the value at the outset. Similarly, very considerable changes in the chemical composition of the gas take place during the progress of distillation. The carbon dioxide quickly reaches a maximum, at about the same stage as the carbon monoxide; but the latter is then produced in steadily increasing quantity, while the carbon dioxide is more rapidly produced in smaller proportion. The curve (fig. 3) indicates that, during the first period of distillation, water gas is formed from the moisture in the wood—the water vapour being decomposed by the incandescent wood charcoal without there being any reduction of carbon dioxide. On the water gas ceasing to be produced, the reduction of the carbon dioxide to carbon monoxide proceeds in the normal course. Inasmuch as water gas, which has a calorific power of only 2600 calories, reduces the calorific power of the wood gas, it follows that the gas produced by the distillation of moist wood is inferior to that from dry wood, and such is in fact found to be the case. The yield of gas computed relatively to the weight of dry wood is, on the other hand, greater when employing moist wood. This increase of yield, resulting from the formation of water gas, is likewise realized by working the furnaces at a much higher temperature, and may be done without disadvantage.

It appears that, if the layer of wood charcoal in the retort has not a considerable reducing action, there is produced probably an evolution of gas which takes place suddenly after the first few moments of the charge.

The tar collected from the gas consists of a fluid mass, in which much more viscous constituents can be detected. Wood charcoal

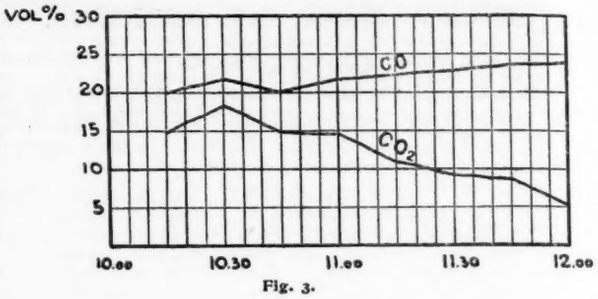


Fig. 3.

was obtained in quantity from 16 to 23 p.ct. of the dry wood employed, averaging 19 p.ct. The foregoing tests were made with fir and birchwood; the latter containing 17 p.ct. of moisture, and yielding 737 cb.m. per tonne of moist wood and 892 cb.m. per tonne of dry wood. The calorific power of the wood gas was 3347 calories per cb.m.; the proportion of carbon dioxide 12 p.ct.; and the yield of wood charcoal 18 p.ct. Since most of the available supplies of timber in Sweden are pine, no further study was made of the distillation of birchwood.

The results obtained from the experimental tests described above having been considered sufficiently satisfactory, steps were taken to use wood on the industrial scale—employing the wood charcoal as part of the fuel for the furnaces. A bench of nine retorts was put aside for the experiments on the large scale; the gas produced being mixed with that made from coal. It was speedily seen that the hydraulic main (designed for a given production of gas and for tar of ordinary composition) was inadequate both for the enormous quantity of gas and for the large amount of aqueous liquor produced in the distillation of the wood. Moreover, the gas supplied to consumers was found to have a calorific power less, and a density greater, than those obtained in the course of the test already described. The cause was judged to be the entrance of air into the hydraulic main when the lids of the retorts were open for charging. As a result of the great production of gas under high pressure, the liquids in the hydraulic main were violently agitated to the extent of being discharged on one side by the tar overflow and on the other by the pipe for the ammoniacal liquor. In order to remedy these drawbacks, the tar-main was provided with a tap which was usually kept closed, but was opened only from time to time in order to let the excess of tar pass off. A layer of thick tar remained in the apparatus, and required the use of steam to cause it to flow. An analysis of this tar was made after a somewhat lengthy decantation. The results are shown in comparison with those of coal tar.

Analysis of Wood and Coal Tars.

—	Wood.	Coal.
Specific gravity	1·686	1·139
Flash point	100° C.	45 5° C.
Free carbon (sample containing water)	9 30 p.ct.	8·75 p.ct.
Free carbon (dry sample)	18·45 ,,	9·81 ,,
Degree of fluidity in Engler apparatus—		
At 20° C.	..	40 ,,
40° C.	..	9·6 ,,
60° C.	143 ,,	4·12 ,,
80° C.	31·3 ,,	2·42 ,,
By fractional distillation in the Senger apparatus—		
Up to 100° C. (water)	39·8 ,,	10·7 ,,
100° C. (oil)	1·6 ,,	2·2 ,,
100° to 130° C.	0·5 ,,	1·3 ,,
130° to 170° C.	0·1 ,,	0·1 ,,
170° to 230° C.	0·8 ,,	6·4 ,,
230° to 270° C.	3·6 ,,	12·3 ,,
270° to 290° C.	2·6 ,,	2·4 ,,
290° to 330° C.	13 2 ,,	7·6 ,,
Residue (pitch)	37·8 ,,	57·0 ,,

As regards heating the furnaces, it was very soon seen that the mixture of wood charcoal and coke served perfectly in the generator, provided the secondary air was carefully regulated. The temperature was somewhat lower than with coke; but, as it reached 1130° C., it was quite high enough for distilling wood. The yield of gas amounted as a rule to 634 cb.m. per tonne of wood, containing 16 p.ct. of moisture; the wood gas having a calorific power of 3400 calories per cb.m. and containing 16 p.ct. of carbon dioxide.

In regard to the proportion of fuel which is required for heating the retort furnaces, M. Molin cites figures showing that when the coal is distilled a little in each retort, the fuel works out to about 32 p.ct. of the weight of the moist wood—equivalent to about 29 p.ct. of coke. On the other hand, if the whole of the coal is distilled in one retort, and the others are employed exclusively for wood, the proportion of fuel may be stated as about 25 p.ct. of the moist wood or 23 p.ct. of the total wood and coal distilled.

At the annual meeting of the Manchester Section of the British Association of Chemists, strong opinions were expressed by the members in favour of registering the Association under the Trade Union Acts.

MODERN AMERICAN PURIFICATION PRACTICE.

A series of articles has been published in the "Gas Age," by Mr. F. W. Steere, of Detroit, comprising a comprehensive view of methods applied in removing sulphur from gas, the working of existing apparatus to meet the greatest demand with the least expenditure, and the designing of new installations that will give the best possible return for the capital so invested. The distinctive differences in American, compared with British, practice, are the use of boxes up to 10 ft. or more in depth, occasionally circular in section, and having more elaborate arrangements of valves and connections for controlling and frequently reversing the flow of gas. The author states his conclusions as follows.

Lime and oxide are the only materials available for use on commercial lines; lime being rarely employed on account of the cost. When used, it should be properly slaked by adding the full requirement of water at one operation, in preference to sprinkling from a hose, which will prevent overheating and give a homogeneous mass. Forstall's method, as set before the American Gas Association in 1875, has not been improved on. He passed the slaked lime through a 1 in. wire screen set at an angle of 70° to the horizontal—thus obtaining granular pellets of irregular size—and used as much water as the material would stand without clogging the sieve. The pellets could be handled and shovelled without losing independence (though the slightest compression or hand working would cause them to cohere), and were used in 6 to 8 in. layers—generally four to a box. The weight of quicklime was 54 lbs. per cubic foot, and that of slaked lime 70 lbs., of which 27 lbs. consisted of CaO. By theory, 1 c.ft. of quicklime should take up 183 c.ft. of CO_2 alone, or 181 c.ft. of H_2S alone; and in practice, 1 c.ft. of properly-prepared quicklime would purify 6000 to 10,000 c.ft. of gas containing 2 p.ct. of CO_2 and 1 p.ct. of H_2S. Shell lime would deal with twice this quantity. If lime is used, the removal of CO_2 is unavoidable.

The use of ferric oxide ($Fe_2O_3+H_2O$) did not receive serious attention in America until about 1885; and its advantages were so obvious that it rapidly replaced lime. A cubic foot of oxide mixture containing 21½ lbs. of Fe_2O_3 purifies 30,000 to 35,000 c.ft. of a gas containing 1 p.ct. of H_2S, before it is spent, and, with well-designed boxes and operation, need not be handled more than two or three times during its working life. Volume for volume, it has four to six times the purifying capability of lime, which must be handled three or four times as often to purify an equal quantity of gas; and, on account of the thinner layers, the expense of each handling is greater. The best number of boxes is three; and the next is two sets of two boxes each in series, with one catch-box that will serve either set. Four boxes to a set are not required, unless the quantity of H_2S to be removed is high, or exceptional labour conditions exist.

The proportion of C_2S in American gas is decidedly lower than in British; and, with a few exceptions, special arrangements for its removal are not necessary.

According to theory, 1 c.ft. of oxide, containing 21½ lbs. of Fe_2O_3, will purify 15,000 c.ft. of gas without revivification. But several considerations—such as economy, number, and design of boxes, velocity of gas flow, exigencies due to purifier changes and varying loads, and the gradually decreased proportion of ferric oxide in the mass as purification proceeds—make it impossible to reduce the whole of the oxide to sulphide without revivification. The theoretical capacity is reduced to 50 p.ct. on the first cycle, with progressive decrease in those succeeding. Without the use of revivification *in situ*, either with or without the simultaneous passage of gas, the material must be handled some fifteen or even twenty times during the working life. But this process is generally adopted, and ideal results would be obtained by the presence in the gas of 0·5 p.ct. of pure oxygen for each 1 p.ct. of H_2S. Although increased illuminating power and all-round efficiency has been claimed, the cost of pure oxygen, and other practical difficulties, are prohibitory, and in practice air is used, of which 2·5 p.ct. will be required to balance 1 p.ct. of H_2S. It is not usual to take more than 2 p.ct., which is found sufficient to carry the charge as far as it will go, without tendency to cake from the deposit of free sulphur or naphthalene.

When a gas containing 2 p.ct. of air is admitted to a bed of clean oxide, the excess of H_2S at first oversteps the revivifying action; but as it progresses, the H_2S is steadily reduced, and the free air increases, until eventually the oxide is revivified as fast as it is fouled. Meanwhile, the fouled condition is steadily penetrating. If the flow of gas is reversed at about the time that the action reaches the centre, the same course follows in the opposite direction. The air gradually meets increased proportions of sulphide, under conditions that secure the best effect. Intervals between the reversals of flow are governed by local conditions, which can readily be ascertained. Generally, the box reversals are made daily, or oftener if a foul test appears at the inlet of the last box; and the series reversals should take place once a week. The following is a recommended change scheme for a series of three boxes: 1, 2, 3; 1, 3, 2; 3, 1, 2; 3, 2, 1; 2, 3, 1; 2, 1, 3.

Revivification by injection of air into a box shut-off from gas requires careful operation, on account of the liability to overheating. An arrrangement that has proved satisfactory consists of a blower connected with the purifier on a closed circuit, by which air is rapidly circulated at three times the usual velocity of gas. It is quickly diluted by loss of oxygen, and this loss can be replaced by the admission of regulated quantities of fresh, and the withdrawal of stale, air, through valves that can be adjusted as required, in proportion sufficient to maintain a safe temperature at the outlet. If the temperature runs high, action can be reduced by shutting-off the supply of fresh air.

Concrete boxes, square or rectangular, are recommended, situated in the open, but almost completely buried below ground. They should maintain a temperature of not less than 60° at all seasons of the year, and a preference is expressed for 80° or 100° Fahr. They should be set in line with sides touching, not exceed 40 ft. in the largest dimension, and the size should agree with the Steere Engineering Company's formula.

Seventeen rules for determining the size are discussed at length. That most frequently used provides a gas velocity of 1800 ft. per twenty-four hours. The Steere formula is:

$$A = \frac{G \times S}{3000 \times (D + C)} \qquad G = \frac{3000 \times (D + C) \times A}{S}$$

When G = c. ft. of gas to be purified per hour (corrected).
S = a factor for H_2S content, ranging from 480 for 240, to 720 for 1000 grains per 100 c.ft.
D = total thickness of material traversed—depth of oxide in each box, × by the number of boxes or series in each set.
A = cross sectional area of one purifier. In duplex boxes with divided flow and two equal layers, A = double the cross section, and D = the depth of one layer only.
C = a factor of 4 for a two-box series, 8 for three, 10 for 4, and 6 for two boxes in parallel with catch purifier.
3000 = assembling factor.

As an example, the size is stated for a set of three duplex in series, two 4 ft. layers in each box, to purify 3 million c.ft. of gas per twenty-four hours, containing 600 grains of H_2S per 100 c.ft. The various formulæ indicate dimensions ranging from 16 to 32 ft. square, and the Steere formula gives 25 ft. square.

$$A = \frac{3{,}000{,}000}{3000 \times 24} \times \frac{600}{(12 + 8)} = 1250, \text{ and } \frac{1250}{2} = 625 = 25 \times 25.$$

Two-box sets, with 4 to 5 ft. thickness of oxide in each box, can be used for a production not exceeding 200,000 c.ft. of gas per day, and not more than 600 grains of H_2S per 100 c.ft. They are also satisfactory in parallel series on a larger scale, in which case an additional catch-box is recommended, available for either of every two sets. But a set of three in series is preferred, as meeting all demands, large or small, with the utmost efficiency and economy, both of first cost and operation, if arranged for flow reversal and full flexibility of sequence. Or four boxes can be arranged to work either in series, or as two sets in parallel, and give any desired combination or series. Duplex boxes with thick layers afford great saving of ground area and construction material, without loss of efficiency, as they comprise practically two boxes under one cover, with one set of connections and half cover track haulage.

A simple form of four-way valve with full-way passage fixed inside each box, and actuated by a rod passing through a stuffing box, is so arranged that independent reversal can be effected without altering the inlet and outlet, and is an addition to the usual connections. And a set of piping, including twelve rack-valves for three purifiers, permits every possible combination, and, in conjunction with box reversing valves, gives 146 possible changes.

A trolley with chain lift attached, travelling on overhead rails supported on columns and girders, is recommended for small boxes; and a gantry or structural steel bridge, travelling on rails anchored to the concrete walls of the purifiers, for larger sizes.

Four hand-operated lifting screws with jaw clamps at the lower extremities are mounted at the four corners. A safety dumping door for the bottom of the overhead boxes comprises two flaps or doors opening outwards. An opening in the grids immediately above allows oxide to rest directly on the inner door, which will not remain closed until the outer door is shut upon it and clamped into position.

Benzol for the Dye Industry.—The Board of Trade desire to draw the attention of dye manufacturing firms to the fact that they are in a position to supply quantities of pure benzol for dye-making purposes, delivered *ex* storage tank at various centres, at 1s. 9d. per gallon. As the supply is limited, it is desirable that inquiries, even if for forward delivery, should be made at once. All orders should be addressed to the Commissioner for Dyes, Board of Trade, No. 7, Whitehall Gardens, London, S.W.1.

Treatment of White Pine with Creosote.—If white pine be treated with creosote it becomes very durable, according to an expert witness before the Industries Committee, in Wellington (N.Z.). The process, he said, was therefore, an extremely valuable one. Besides preserving wood, creosote made it fungus-resisting, which was of the utmost importance. A process, stated the witness, was adopted in New Zealand before the war; but it was discontinued, on the score of expense. A new process had, however, since been invented, whereby only one-half the amount of creosote was required. It had been suggested that creosote should be manufactured in New Zealand; but when the gas companies were appealed to, they stated that they already had a large demand for all the tar they produced. Witness proposed that a bonus of 2d. per gallon should be paid for all creosote made in New Zealand.

BRITISH COMMERCIAL GAS ASSOCIATION.

THE SOUTHERN DISTRICT BUSINESS CONFERENCE AT READING.

The British Commercial Gas Association are resuming their full activities; and after the war interruption of District Conferences, the Southern District opened up a fresh series by members meeting at Reading on Monday last week. Reading is a very convenient centre for the representatives of many southern gas undertakings; and the administrative and executive elements of the Reading Gas Company, modernly progressive in all their doings, know well how to do a big share in making such a conference successful by planning the local arrangements, and taking part in the proceedings. The Chairman of the Company (Mr. G. W. Webb, J.P., F.R.I.B.A.) presided throughout the day; and those of his directorial colleagues who could be with him—Messrs. T. E. Hewett (Vice-Chairman), S. Hayward, G. Philbrick, and A. S. Cooper—did their utmost to assist him, especially Mr. Hayward, who is the Mayor of Reading. Mr. D. H. Helps, the Engineer and Manager of the Company, had been the active instrument in making the local preparations; and he, with Mr. A. B. Stedman, the Company's Secretary, looked well after the comfort of the visitors during the day. Through the influence possessed by these various gentlemen, the beautiful hall—somewhat large for the purpose, but nevertheless deserving the admiration it received—of the Reading University College was courteously placed at the disposal of the visitors; and this was deeply appreciated. Mr. F. W. Goodenough (Chairman of the Executive Committee) and Mr. W. M. Mason (the Secretary) also contributed largely to the success of the proceedings.

A Welcome by the Mayor.

At the opening of the proceedings,

The Chairman (Mr. G. W. Webb) asked his colleague, the Mayor, to offer a welcome to the members.

The Mayor, in the course of his remarks, said he had great pleasure in giving hearty welcome to the members of the Southern District of the British Commercial Gas Association. Reading was always pleased to welcome Associations such as this, especially when meeting for business purposes for the benefit of the towns from which the members came. He was the eighth Mayor of Reading who had also been a Director of the Gas Company. The late Chairman (Mr. J. Oakey Taylor), who was the Chairman of the Company since 1862, and the only Chairman preceding Mr. Webb, was Mayor of Reading in the same year that he became Chairman of the Company. He named the other members of the Board (some of whom have passed away) who had filled the mayoral chair, and these names, he said, showed that the Company had not been altogether dissociated from municipal politics. He was pleased to see the members there that day, because he felt that it was for the benefit of mankind, especially in regard to improved social and hygienic conditions. There had been a great improvement in the air of our towns since gas had taken its rightful place in the heating field; and the more this change took place, the less would they suffer from smoke nuisance and air contamination. He had sent to him the other day a pamphlet describing gas installations for housing schemes. As a member of the Housing and Towns Planning Committee, it would be of great use to him and the other members of the Committee to study the booklet, and see what could be done in carcassing houses for the use of gas. He was sure it would be for the benefit of gas undertakings when this was done. There was at present an open field; but he saw no reason why gas should not be installed in preference to electricity. In concluding, he said he hoped the Conference would be a great success.

Some Suggestions for our Organizations.

The Chairman remarked that, on behalf of the Directors of the Reading Gas Company, it afforded him much pleasure to welcome the members there that day, more especially as it was one of the first, if not the first, District Conferences held by the Association since the termination of hostilities. They hoped that the turmoil and strife of the past four-and-a-half years would never be resumed, and that the conference now taking place in Paris would result in a satisfactory and lasting peace. He was in entire sympathy with the objects and aims of the Association, which he understood were not alone to advertise gas, but also to show the public how to use it to the best advantage, and how to avoid waste. It could be claimed that the Reading Gas Company was one of the first to recognize the importance of carrying out such work as the Association now undertook. Previous to the formation of the Association, their very able and energetic Engineer devoted much time to the drafting of advertising literature for distribution among the consumers, and in controverting the many erroneous statements which were then so often made with regard to gas lighting and heating. Some years before the Association was formed, they recognized the necessity for collaboration with other gas companies in such matters, and, in conjunction with the Bournemouth Gas Company, issued some most useful literature. If, however, there was need for the formation of such an Association in the year 1911, there was now double scope for its activities; and in this connection he would refer to the Government's electrical power scheme. He was not an expert on such matters; but when he first read comments on it in the Public Press, he had his doubts as to whether it would—from the country's point of view—be a paying proposition. The popular idea seemed to be that electric cables would be carried from large power stations, not only to towns, but into every village, and even to isolated farms, so that machinery for milking cows and making butter could be driven by electricity. He had since read Prof. Cobb's criticism of the scheme in the January issue of the "Edinburgh Review," and also Sir Dugald Clerk's more recent lecture at the Royal Society of Arts. Both these experts showed that, if the object of the Government was to conserve coal, the best way to do so was to convert it into gas, which would result in 75 p.ct. of the heat value of the coal being made available for public use, whereas, if coal was used for the generation of electricity, only about 8½ p.ct. under present conditions became available, and, under the proposed scheme, the amount, though larger, would only be 19½ p.ct. He was pleased to see that the Association had had Prof. Cobb's powerful criticism reprinted for circulation. No one would suggest that electricity could not be usefully employed for many purposes; but before public money was expended to the extent suggested in the power supply report, it was obvious that further investigation was necessary, and more particularly in connection with the extension of gas production. Apart from the convenience with which electricity could be applied, its mystery gave it a glamour in the public eye which made it a keener competitor than was justified by its intrinsic value. During the war, it had not been possible for the Company to pay so much attention as formerly to the upkeep of gas apparatus in consumers' houses. Most of their Engineer's efforts had been devoted to maintaining the output of gas from the works. They thought it was desirable to maintain as efficient a supply as possible to the existing apparatus and consumers, rather than to add to their liabilities, unless a war interest was involved; and they, therefore, ceased for the time to fix gas fires and cookers. A very large number of fitters joined the Forces, as did the men employed in the maintenance of consumers' burners. The women who took their places did their best; but the public should not judge as to the capabilities of gas from their war-time experience of it. In addition to the shortage of labour, it was extremely difficult to obtain burners, glassware, &c. The district fitters were now returning to the Company. Being skilled men, many of them were late in being demobilized. But he would not speak further of themselves, but of the Association. He looked forward to the day when gas undertakings, instead of paying various subscriptions to different bodies, would pay only one subscription, and that to a central organization, which would allocate funds for such work as the Association was doing in connection with the sale of gas, and to other sections of the industry, including one for carrying out experiments and research work on gas-works generally, or on some works particularly selected for the purpose. He felt very strongly that everything should be done to induce parents to enter their sons in the gas-engineering profession, otherwise the industry might suffer. Gas must be efficiently and economically produced if such an Association as this was to achieve the best possible results. Advertising and propaganda work might sell an indifferent article, or even a bad and expensive article, for a time; but it would not continue to do so. He did not wish to be misunderstood. It was acknowledged that gas undertakings were already selling a good article. He was quite sure that gas engineers would desire to ensure, not only continuity in the sale of a good article, but also endeavour to bring about greater efficiency and any and every improvement in all possible ways. The industry had to face keen competition, and high costs for materials and labour. They needed then more than ever highly trained men in charge of the works. He would venture to make this suggestion, that the National Gas Council—of which the Association were a part—should offer (say) every three or four years, a competitive scholarship in gas engineering, which would include (say) two years on some large gas-plant manufacturer's works, and three years' premiumed apprenticeship on a gas-works. In conclusion, he would urge all undertakings that had not joined this body to do so. He understood that over 80 p.ct. of the gas production was represented in the Association; but how was it that while gas undertakings so far away as Australia and Japan had subscribed to the funds, there were some in this country that only reaped and did not sow?

A Peep into the Past.

Mr. F. W. Goodenough (Chairman of the Executive Committee of the Association) said he would first like to thank the Mayor for the kind welcome he had given the members of the Southern District of the Association to Reading that day. It was very proper they should be meeting in Reading at the present time, because, unless his history was at fault, they were within three weeks of the centenary of the foundation of gas-works in the town. It was on the 21st of May, 1819, that the stone of the first gas-works in Reading was laid; and on Nov. 5 of that year, gas lighting was seen in the streets of the town for the first time. So that they had selected a very proper time for visiting Reading. It was true the Company of to-day was not founded in 1819. Competition was set-up in 1836; and for about a quarter of a century they had two Companies fighting for business. In 1862, the two competing Companies were amalgamated; and since then the present Company had not looked back. As the Chairman had remarked, until last year the Company had only had one Chairman, which was a most remarkable record for (he should say) any industrial undertaking. And he certainly thought that it reflected a great deal of credit upon the administration of the Company and the officers, in that the undertaking had made the enormous progress that had been witnessed from the date of the amalgamation to the time that the Company's jubilee *brôchure* was published. In that period, the output of gas increased from 47 to 614 million cubic feet. He was sure the Chairman would agree with him that a great deal of the progress that had been made by the concern was due to the able officers that had served the Company, as well as to the Board who had given the officers every chance of doing the best they could with the tasks they had to undertake.

WORK AND POLICY OF THE ASSOCIATION.

Mr. Goodenough then made the following statement as to the work and policy of the Association:

There are two points of view from which the work of this Association will naturally be considered at a conference such as

this—that of its capacity for service to the gas industry, and that of its capacity for service to the community as a whole. But in fact these two are essentially one. The Association cannot truly serve the permanent interests of the gas industry unless it truly serves the interests of the public which the industry exists to supply. Good service to what lawyers would call "the party of the other part" is the only true basis of permanent commercial success, as of all real success in life, public or private.

In the case of the gas industry, moreover, we are in a special sense public servants, entrusted with certain monopoly rights which entail consequent duties. One of those duties—one which has called this Association into being—is undoubtedly to extend our business in every way that is mutually advantageous to buyer and seller, as thereby we are enabled both to reduce the cost to the community of one of the necessaries of life which we alone can supply, and to do service to the public health.

It may sound strange for anyone to be urging others to do as a duty what to most business men would seem the most natural thing to do from the point of view of self-interest—viz., to seek to extend business in all possible profitable directions, and by the most thorough methods. Yet it is by no means unnecessary even to-day to urge this in the case of a good many gas undertakings (though certainly not in the case of Reading)—as, indeed, it is necessary in the case of many other British enterprises—owing to the readiness of many people to be content with a reasonably prosperous business, and to dislike new activities, new methods, new enterprises, which call for positive policy and definite action. There is an all too high "percentage of inerts" to be found in other parts of many gas-works than those where gas is made. "We are doing very well," say some people; "why worry about doing better? All this publicity and salesmanship, this business-getting, means a lot of work. Why not leave well alone?" In other cases, undertakings once constantly progressive believe they still are, forgetting that to be progressive it is necessary to progress, not merely to have progressed. The war has done much to disturb any such attitude of complacency; and our present object is to point out that it is the business of the Association to assist in being progressive the undertakings which support it; and it may not be amiss to mention again that they include all the principal municipal gas undertakings as well as the companies, and represent 83 p.ct. of the gas made in the kingdom. It is the Association's business to reduce the work, the thought, and the worry entailed in developing new and additional business, and make it easy for its members to initiate and carry out local plans of campaign for extending the use of gas and coke, as well as on their behalf conducting with the same object national campaigns such as no individual undertakings could undertake separately. It is the Association's job to be the Sales Organizer for the industry. Mr. Holland will later give you the details of a scheme that has been prepared for undertaking this service more efficiently than hitherto.

Service to the Community.

In doing this work, the Association must, as has been said, if it is to achieve permanent success, do service to the community. How has it done such service in the past, and how can it do it in the present and the future? Briefly, by supplying the public regularly with reliable information concerning the questions of light, power, and heat—questions which affect every home and every business. Let us see what this has meant, and may mean. It sounds very simple; but it means a very great deal—especially when it is remembered that to provide itself with light, power, and heat the nation uses up at present about 200 million tons of coal each year, and wastes the greater part of it! In the little more than two years of its active existence before the war, the Association had already done a good deal to awaken public interest in the advantages to the health of the nation (as well as to the comfort and convenience of the individual) that accrue from using, in the place of crude coal, its purified essence (gas), and the smokeless bye-product of its carbonization (coke)—advantages which accrue, that is, as a natural consequence of the resultant decrease in the smoke nuisance and the corresponding increase in sunshine in our cities, and of the decreased dirt and dirty work in our homes and factories. On these points, the Association was and is able to adduce voluminous and growing independent scientific and medical testimony. Because of all this, and because moreover medical testimony also made it clear that the modern gas-fire was a wholly hygienic source of heat—and after all, what is a coal fire but a gas-fire burning unpurified gas? It is all a question of the proper removal of the products of combustion in both cases, and of avoiding over-heating the air, a fault of the old, but not of the modern, gas-fire—the use of gas for heating, cooking, and hot-water supply was extending rapidly when the war intervened, and diverted all thoughts and energies to whatever made for its successful prosecution. In that crisis, it may be said, the gas industry, and this Association as one of its organized forces, proved of very real value to the community.

Work during the War.

At the outbreak of war and onwards, the Association did everything possible to assist the public, both directly and through its members, to improvise war establishments and factories of all kinds; and the use of gas for fuel and power, as well as for lighting purposes, it may be pointed out, effected great savings in time, transport, labour, space and money in barracks, hospitals, nursing homes, hostels, canteens, and munition works of every description all over the country. At later stages of the war, the Association organized publicity which assisted the public to practise both food and fuel economy in every home; to preserve surplus fruit and vegetable foods, in co-operation with Dr. Keable, formerly of Reading University; to dispense with much domestic service; and to realize that the use of gas and coke instead of crude coal was a national duty as well as of individual advantage, because our fighting forces had to rely largely upon bye-products of gas manufacture for the bases of the high explosives so vitally necessary to them.

In the latest stages of all, the Association has worked to make the rationing of gas supplies as equitable and as little attended by hardship as possible. But here the "Controller" certainly came within the category of "circumstances over which we have no control," or not by any means as much as, in the national interest, it would have been well if we had. Let us hope the days of gas-rationing are numbered, and will soon be no more (though the list of industries decontrolled, as published in the morning's paper did not unfortunately include gas), so that the work of diverting coal from the wasteful grate to the productive retort-house may proceed apace. We have also throughout the war, as before, spent a good deal of money in propaganda work among the medical, architectural, and teaching professions.

Directions of Current Service—Electrical Claims.

Now that the war is over, in what directions can the Association on behalf of the industry serve the public most usefully? There are three questions prominently before the public and in the Government programme to-day: Housing, Transport, and Coal Conservation. The first two far more acutely interest the public than the last, which has, indeed, in the manner of its presentation by the Reconstruction Committees only served to lead people astray, and beguile them with false hopes. For the public have very generally been led to believe, as the result of certain one-sided reports on Coal Conservation, that the panacea for all, or most of, the difficulties in regard to each of the three questions named is to be found in the general use of electricity, not only for light and for motive power, but for all fuel purposes. This (not to put too fine a point upon it) is absolute nonsense, and is so regarded by all well-informed electrical engineers. It is not the policy of this Association to decry or belittle electricity. The gas industry fully recognizes the enormous value of electricity and its potentialities in many directions. Its great achievements, its possibilities, its mystery, fascinate every thoughtful and inquiring mind. Its services in the realms of message transmission—by submarine cable, by wire and by wireless; of voice transmission—by wire and without; of surgical and medical treatment; of lighting; of power, both stationary and mobile; of extreme high-temperature furnace work—are great indeed, and will be greater. Foolish would be he who would deny or minimize them. But equally foolish would be he who failed to realize that the possibilities of electricity are also finite (in certain respects to our positive knowledge definitely limited by physical laws, and in all other respects so limited though not as yet to our precise knowledge), and are not, as some superficial thinkers and writers would have us believe, boundless and destined presently to provide the universal medium of light, power, and heat. Let us get down from such romancing to hard facts. Electricity, in this country, has to be obtained as to all but a negligible quantity by the conversion (1) of coal into heat, (2) of that heat into mechanical energy, and (3) of that mechanical energy into electrical energy. That sounds like waste, and waste there is, becoming indeed, as Lord Moulton has said, a ghastly waste if finally the electrical energy is to be reconverted back into heat. What are the figures?

Every unit of electrical energy can be re-converted into 3420 heat units. No engineer or scientist living or to be born, can improve on that, any more than he can make something out of nothing, or reverse the laws of Nature. To produce and deliver to the consumer the electrical energy which can yield him 3420 heat units (and no more) wherewith to heat his room or cook his food, how much coal must be burnt at the generating station—and how much coal would be required at the gas-works to provide him with gas capable of doing the same amount of heating or cooking?

Here is a summary of the facts on these points, based upon statements recently made by Sir Dugald Clerk and by Prof. Cobb, endorsed by Lord Moulton, and not disputed by the electrical industry:

1. The average (not the worst, but the average) electric generating station of to-day destroys coal containing 100 heat units in the process of delivering to the consumer 7 heat units in the shape of energy—a loss of 93 p.ct.
2. The most efficient generating station of to-day shows a loss of 88 p.ct., delivering to the consumer as energy only 12 heat units out of every 100 in the coal burnt under its boilers.
3. The best result anticipated for the suggested super-stations (but never yet realized in practice at any existing station, and there are some large units in use) is an efficiency of only 18 p.ct.—82 heat units lost in generation and distribution for every 18 delivered to the consumer.
4. Out of every 100 heat units in the coal carbonized at the "good practice" gas-works of to-day (in round figures) 50 are returned to the solid fuel market as coke; 5 are recovered as tar; 22·5

are lost in manufacture and distribution, and 22·5 reach the consumer as gas. So that out of 100 heat units in the coal carbonized, 77·5 are delivered to the community and only 22·5 are lost; while out of heat units that do not re-appear after the process of carbonization as anything other than gas (22·5 out of 45) 50 p.ct. are delivered as gas to the consumer.

5. In the gas-works of the future, it is possible that coal will be as completely as possible gasified, and that 75 heat units out of every 100 in the coal treated will be available for distribution as gas, as against only 18 out of 100 available if the distribution be in the form of electric energy generated at super-stations.
6. After allowing in both cases for all losses in transmission and utilization—that is, after giving electricity credit for its somewhat higher "efficiency of utilization" than gas—there would be involved in the doing of equal heat work for the consumer the destruction of 4 tons of coal at the electric generating station of to-day as compared with 1 ton at the gas-works of to-day; or 3 tons at the super-station of the future, as against 1 ton at the gas-works of the future.
7. To give the gas consumers of to-day equal service to that rendered them for a destruction (net) of 10 million tons of coal, the electric generating stations of to-day would destroy 40 million tons and the super-stations 20 million tons at least; and, in so doing, would destroy all the valuable bye-products recovered when coal is carbonized.
8. To displace the 40 million tons of coal now used for domestic fuel by gas (these are figures deduced from Sir Dugald Clerk's data and the Coal Controller's estimated gas equivalent of coal for fuel purposes), a net destruction of only 30 million tons would be involved if gas carbonized at the works of to-day were used; whereas if electric energy were employed, instead of 40 million tons, 120 million tons would be destroyed at the generating stations of to-day, or 60 million tons at the super-stations, if they proved as economical in coal consumption as promised.
9. From every additional ton of coal carbonized at gas-works, instead of being burnt among the 40 millions now used direct as domestic fuel, there would be recovered valuable chemicals—dyes, drugs, disinfectants, oils, motor spirit, artificial fertilizers, to name only a few of the substances of which coal is a veritable storehouse—which are at present destroyed or sent up the chimney to pollute the air, and would be so destroyed if the coal were burnt to raise steam to generate electricity.

To use electricity as a fuel on any scale is therefore clearly seen to be absolutely out of the question from the point of view of the conservation of coal and its chemical constituents; as it is also from the point of view of cost. The facts are indisputable; but they have been unknown to, or overlooked or ignored by, those who, in the name of coal conservation, advocate the use of electricity for heating and cooking in connection with the great housing problem that is of pressing concern alike to every local authority, to every citizen, and to the nation as a whole.

The Fuel of the Future.

In the fields of lighting and power, electricity contends with gas on grounds unconnected with coal conservation, as its relatively high efficiency of conversion in those cases largely counterbalances its relatively and positively high waste in generation. Under some conditions and in some circumstances, electricity will be preferred to gas for light or power; in others gas will be chosen, especially where, as in artizans' homes, the moderate warmth from a gas-light is generally welcome, or where, as in factories and businesses generally, cost is a ruling factor. But where heat is what is required, there can be no doubt that gas has it—that "gas is the fuel of the future." For it can further be shown that it is possible from the point of view of economy to the consumer, taking his budget as a whole, as well as desirable from the national standpoints of coal saving, bye-product recovery, labour-saving, transport economy, and smoke abatement, for gas and coke to displace a large proportion of the 40 million tons of coal now so wastefully burnt in our grates and ranges. In transport alone, there would be a net saving of 25 million tons, because it must be remembered that coal has to be twice transported—*i.e.*, by rail or sea to the town, and then by road to the consumer; while, in the case of gas making, the coal goes straight to the works in bulk, and only the coke has subsequently to be carted to the user.

Housing and an Exhibit.

The substitution of gas and coke for crude coal in our homes—to say nothing of a similar substitution in our industries—would treble the output of the gas industry, and greatly reduce the cost of gas all over the country. This is something for us to work for, and to make us feel we have not yet reached the end of our tether by a very long way.

With these facts before them, is it too much to hope that the housing authorities throughout the country will recognize that, in all town planning and housing schemes, the most complete and modern arrangements must be made for the use of gas and coke for heating, cooking, and hot-water supply, and that these should not be left, as they have so often hitherto been left, to be subsequently imposed upon plans based on the use of coal, but should be integral parts of the original designs. In the preparation of such plans, the Association and its members will gladly, to the fullest possible extent, assist architects, builders, or housing authorities in any part of the country.

At an exhibition shortly to be held under the auspices of the "Daily Express," the Association will show a model based upon the plans of the architect who won the first prize in the housing competition; and this prize plan, I am glad to say, provides for the use of gas very largely. The model which the Association will show will comprise the ideas of the architect, as well as of the Association in regard to gas apparatus.

A Duty to Advertise—Housing Booklets.

Mr. Frank Livesey (President of the Southern District Association of Gas Engineers and Managers) said he was sure all present had listened with great interest to the very clear and concise description, by the Chairman of the Executive Committee, of the activities of the British Commercial Gas Association during the war. The first thing that struck him in listening to Mr. Goodenough's remarks was what an extremely good case they had with regard first of all to the conservation of fuel, and secondly with regard to the installation of their product in the houses which were to be built under the schemes now before the country, as well as the fact that the domestic servant problem was facing them at the present time. Having these things before them, it was impossible to imagine they should not advertise what they were able to do. Advertisement was the largest province for which the Association existed. Always a source of admiration to him was the way in which the Association had conducted its advertising, not only in the Press, but in the quiet unobtrusive method which was so very effective. He was sure that no administrator of a gas undertaking, whether in financial or executive position, could for one moment imagine that in these days the gas industry could afford to go on without advertising. They were all conscious that there was a certain amount of public feeling in favour of their competitor. They had to realize this. Had it not been for the Association being in existence the last few years, the feeling would have been much stronger. Having a very strong case, it was their duty to put it before the public in every way. It was very useful to hold these District Conferences, because, by them, they showed the local gas administrators that the Association was very much alive, and was casting about for every possible way to instil into the public mind the fact that gas was still, and would continue to be, one of the greatest boons to the housewife. He had had the privilege of perusing the little booklets that had been prepared by the Association on the housing schemes; and he went so far as to say that any gas administrator would be sadly lacking in a sense of duty if he did not use the booklets in the most effective way. A statement was made by an official of the Maidstone Corporation that electricity was to be used in the houses that were to be built under the ægis of the Corporation. Since distributing copies of these booklets, and interviewing the Housing Committee, he had been informed that the remarks were quite unjustified. His (the Maidstone Gas) Company had also invited the Committee to inspect the houses that had been put up near London. He had carefully considered the case they had with regard to fuel conservation; and he had been particularly interested in the speeches lately made by the chairmen of electric supply companies in London, who bore out very largely the opinion that gas men held as to the national electricity supply schemes. He believed by patient spade work, they would do a great deal to show the public that the schemes put forward were not all they were represented to be.

Lieut.-Colonel H. W. Woodall had much pleasure in endorsing the remarks Mr. Livesey had made. It seemed to him it was the obvious duty of all gas companies at the present time to support the Association to their utmost. Without successful advertising methods at the present time, they would certainly be in a parlous state, because there was no doubt the electrical industry had a number of influential friends who looked upon it as a more up-to-date industry than that of gas supply, and so it would be if they judged by what the gas industry was twenty years ago. But the gas industry had made great advances during that period; though its some time more active opponents had made a bigger flourish. In these times, with large electrical schemes to the fore, it was very essential the gas industry should do its utmost to state its case in the best possible way—not only as the gas industry, but as an industry of immense importance to the nation. They were not content to take second place to the electricity industry, when in a position to show that the gas industry was the more important, and was rendering better service to the country. It was a great comfort to know that 83 p.ct. of the gas made in England was represented in the Association. This was a very fine figure. They were only sorry there were undertakings supplying 17 p.ct. that stood on one side, and took advantage of the efforts of others.

Mr. W. Lees Stenning (Chairman of the Redhill Gas Company) thanked Mr. Goodenough for his very able address. As a Director of a comparatively small gas company, he should like to say that they had undoubtedly derived very great benefits from the Association. Like Mr. Livesey, he believed that the unobtrusive part of the work of the Association was of the greatest value. In the case of the Redhill Gas Company, they had had information which they could not have got publicly, and which had been utilized by their Managing-Director with good effect. The literature, too, of the Association had undoubtedly helped them in obtaining new customers. At the present time, the gas industry was faced with keen competition—perhaps not the fierce competition of the future; and, in these housing schemes, they must be prepared to put forward their best efforts, and obtain a fair share of the business. They must not expect to obtain it all; all they wanted was fair play and an open field. He did not wish to preach to the converted; but he thought perhaps there might be some present who were not yet members of the Association. They must not be selfish, and must bear in mind that, in joining the Association, they were helping the whole industry. The 17 or 18 p.ct. of gas output not represented in the Association he imagined covered a great many undertakings. One thing that impressed him was that a new consumer was made and in time he probably left the neighbourhood, and went farther afield. If he had been a satisfied consumer, they were then handing on a consumer to the company to whose district he happened to go. If such points as this were recognized, other undertakings would readily join the Association, and not accept the privileges and results which unquestionably were at present obtained without payment.

Some Striking Illustrations as to Value.

Mr. W. M. Mason (the Secretary) said there were four simple facts he should like to lay before the members. The first was that in towns where District Conferences were held they made it a practice of inquiring at the local bookstalls how many publications were sold and

circulated locally in which the advertisements of the British Commercial Gas Association regularly appeared. He did not think anyone could possibly guess the number. They would probably hardly believe it that in a town like Reading, something between fifty and sixty different daily and weekly newspapers, monthly magazines, and educational and professional periodicals, were in circulation in which the advertisements of the Association constantly appeared. Every gas manager knew that to spend £5 in a paper did not give him much space; and to put advertisements in fifty papers, an expenditure of upwards of £2000 would be inadequate. But by pooling subscriptions, they were able to get publicity in something like fifty first-class publications which were circulating among local consumers. Surely this was a very good return for even a large subscription. The second point was as to the value of the Association's publicity. It might be asked: "Supposing you do advertise, what is the good of it all?" A letter (which was only a sample of many others) reached the Association on April 23, which said: "You kindly forwarded to us the enclosed inquiry of the 4th inst.; by the 16th inst. we had agreed with the consumer to sell him some high-class water appliances at a cost of between £50 and £60." This was a good proof of how business could be secured if inquiries were properly followed up. This referred to a comparatively small company. A week before the Easter Holidays, a letter was received from a gentleman regarding a proposal to put down a very extensive producer-gas plant. He (Mr. Mason), when consulting the Chairman about it, remarked "We are in the other street." The Chairman agreed, but suggested that the correspondent should be interviewed. This was accordingly arranged, and it was found that there was a big housing scheme in contemplation in connection with a new works. After an hour's talk on the possibilities of using producer-gas for cooking and heating, and the serious difficulties had been clearly emphasized, the visitor, who was keenly interested, left with the promise that, if satisfactory arrangements could be made, coal gas, instead of producer gas, would be utilized for cooking and heating in the thousand houses under consideration. This was the third line of "B.C.G.A." service which showed the broad working policy of the Association. The fourth point had reference to that part of the work of the Association which was unobtrusive, and to which two previous speakers had referred. A fortnight before he had received a letter saying that a book was about to be published giving advice on lighting, heating, and ventilation. They wrote and asked to see a sample of the book, or the M.S. One of the sub-editors brought it, and it was quickly seen that, from practically beginning to end, gas was condemned, and electricity recommended. After pointing out that the book was hopelessly out of date, an arrangement was made that the text should, so far as gas was concerned, be thoroughly revised. If this had not been done, the book would have been published with serious inaccuracies in it, and subsequently got into the hands of architects and surveyors who would certainly have been influenced by it. These sample statements of fact might be of use to any non-subscribers who were present; they might also be of service to gas managers when bringing the claims of the Association before their Directors.

GAS SERVICE IN THE NATIONAL HOUSING SCHEMES.

A paper on this subject was next read by Mr. W. J. Sanderman (Croydon). The text, with a report of the discussion appears on pp. 310-13.

Tea was served at the close of the discussion.

A SCHEME FOR SALES ORGANIZATION.

The greater part of the remainder of the sitting was occupied in considering a scheme for sales organization, which was outlined in a paper by Mr. F. H. Holland. The Chairman of the Executive Committee (Mr. F. W. Goodenough) introduced it by an important announcement. For this part of the proceedings see second column on this page.

VOTES OF THANKS.

Mr. GOODENOUGH said, before parting, they must tender their heartiest thanks to the Chairman and Directors of the Reading Gas Company for their hospitality that day, and to the University of Reading for the loan of their hall. They were very much indebted to Mr. Webb and his fellow-Directors, as well as to their good friend Mr. Helps, for all the trouble taken to make them comfortable, and the conference a success.

Mr. H. C. HEAD (Winchester), in seconding, said Reading was one of the best centres in the southern district for a conference of this sort; and they were all greatly indebted to the Chairman and Directors of the Gas Company for the manner in which they had entertained them that day. They had now to begin to put their house in order for the campaign which must soon be started with great energy; and the opportunity which these conferences afforded them was an excellent one for this purpose. One thing which was of the greatest importance was that they were absolutely stultified by the Fuel and Lighting Rationing Order; and before they started canvassing, they wanted to get it pushed out of the way. If they knew this was going to die a natural death, or be vanquished in some other way at an early date, it would, he thought, do more than anything else to pave the way for canvassing campaigns it was hoped to start with renewed vigour all over the country.

The motion was heartily carried.

Mr. WEBB, on behalf of his colleagues and himself, thanked those present most sincerely. The Board would also convey the thanks of the members to the University authorities for lending them their beautiful hall. He must say he thought thanks were also due to their Engineer (Mr. Helps) for what he had done in the matter. It was Mr. Helps who had carried through the details. [Applause.]

Mr. HELPS, called upon by the Chairman, thanked him for his kind remarks, and the members for their endorsement. While the stimulus of the war had gone, the stress and strain that had been brought about by it remained; and it was difficult for many yet to travel to a meeting like this. He should also like to express his thanks to the College authorities for the use of the hall. In conjunction with the University, they held classes in gas supply, which were attended by the Company's men and by anyone who wished to work up the subject. The lectures were delivered by their District Superintendent (Mr. Eves), and the chemical part of the work was in the hands of Mr. Walter Hill. Some of the members had no doubt read the report of the Fuel Research Board. He had done so; and he thought that they might easily that day, and perhaps profitably, have swept out their prepared agenda altogether, and have considered the report solely. There was one thing to which he should like to draw attention in the report and in connection with the Electric Power Sub-Committee's report. The Fuel Research Board were all capable men, picked out specially by the Government; and they stated in their report that the gas industry possessed the cheapest known means of distributing potential heat energy. This was the statement of the Board; and it was a valuable one for the industry; and if they could only get the Government and the public to realize, if they were out to economize coal, that there was only one way to do it, gas undertakings would have more business than they could for a time deal with.

This concluded the proceedings.

DEVELOPMENT OF THE SALE OF GAS.

Outline of a Scheme by F. H. HOLLAND, of the British Commercial Gas Association.

[A Paper read at the Southern District Conference of the British Commercial Gas Association, at Reading, April 28.]

Before Mr. Holland read his paper, Mr. F. W. Goodenough (Chairman of the Executive Committee of the Association) made the following remarks:

Mr. F. W. GOODENOUGH: May I say a few words to introduce Mr. Holland, who, though a member of the staff, is not as yet known to many of the members. The Executive feel strongly there is throughout the gas industry great need for a proper selling organization—proper scientific salesmanship. It is, in our view, the great need of the future that the selling side of the industry should be organized and developed on skilled lines, fully as much as the manufacture of gas is or should be. There has been no previous organization for assisting managers individually on this important side of the gas industry on any extended and complete plan. I am sure you will agree that hitherto, except in the case of a certain number of undertakings, sales development has been unorganized, unstudied, and undiscussed on scientific lines. What has been done in many cases has been largely haphazard and spasmodic—the bye-product of the occasional leisure hour of a very busy man with multifarious other duties on his hands. There has been no standardized, completely planned work in that direction. Some have occasionally appointed canvassers or have had them supplied by the makers, and have turned them loose on the district and told them to bring in business. Sometimes they have done well; sometimes they have not. But what has been occurring to me for a long time is: What do we any of us really know of the possibilities of our districts? All of us know how many consumers are using gas; all of us know what the average consumption per consumer is; and some of us know how many gas appliances there are in use. But how many of us know exactly how many people who might be are not using gas? How many of us have any idea of how many more gas appliances could be used in our districts, or what the average consumption per consumer might be if every consumer's business with us were developed on scientific lines? How many of us actually employ salesmen definitely to increase the average; and how many of us know what relation the results that the salesmen we do employ actually get bear to the possible results they might get? I do not think any of us can really answer all these questions to our own satisfaction. Yet it seems to me that the problem of the future for the gas industry, as for all other industries, is the problem of increasing output, of increasing the turnover, to the utmost extent, thus reducing the cost of what we are selling, and enabling us to reduce prices and increase profits.

This problem of the systematic development of gas sales has been made for a good long time past the subject of very careful study, analysis, and constructive planning. The Executive fully realized the need when the matter was brought before them, and were happy enough to find in Mr. Holland the right man to do the necessary investigation and planning out. He is a man of considerable experience in carrying out selling schemes for progressive manufacturers, one equipped with the necessary sceptical and organizing mind, who never accepts any existing practice as necessarily right, and who is gifted with the ability to analyze the subject of what needs to be done and to create a comprehensive organized plan for doing it. The Executive some time ago engaged Mr. Holland, and I gave him the assistance of several of the most experienced salesmen on my staff to thrash out the whole subject of sales development in the gas industry. He also had several conferences with the Editor and Consultant and many with myself. Indeed, I have given as much time as I could to the subject, as I regard it of the highest importance, and full of great possibilities.

We have now got together a definite scheme for enabling managers to ascertain all the possibilities of business in their districts, and suggestions—that can easily be moulded to fit all local conditions and existing systems—for a scientific attempt to turn the possibilities into certainties, into actual business.

It is a scheme which I hope will be found capable of assisting the busy manager thoroughly to organize and greatly to improve the selling side of his undertaking. It can, indeed, be largely run for him from headquarters if he wants this form of assistance. It is intended to and will I believe provide for the gas undertaking a skilled consultant on sales development. This is the logical and necessary complement to the skilled consultant on engineering work. Many gas undertakings, if they have a big construction job to carry out in regard to their works, call in a consultant to advise them. It has been always the recognized practice to employ a first-class works' designer and builder if one wants to secure first-class work. And what we want is to be able to supply to the industry first-class business builders to enable undertakings to build-up first-class business, to create goodwill for the purchase of the products of good works. That is the underlying principle of the scheme I am briefly outlining to you.

It is a fact that most undertakings cannot afford to employ a whole-time first-class sales manager. But there is little doubt that very many would be glad to be able to engage the services of one, for an occasional period, to overhaul the sales organization in their districts, and give the busy manager, who has to attend to administration, finance, manufacture, and distribution, and can afford but little for sales development (a skilled job in itself), the experience and advice of a man who studies the subject year in and year out in all its aspects. As it appears to me, the outstanding merit of the scheme that has been drawn up is that it will result in the scientific establishment of the possibilities of a district; and thereupon it will be easy to determine the percentage of results that can be obtained from any given effort in selling in the district or any portion of it. It will consequently enable the manager to estimate what his requirements of appliances and labour will be, if he makes a certain effort in connection with the whole or a certain proportion of the possibilities in his district. He will, if he desires, have schemes for business-getting constantly planned for him, as well as carried through to a great extent for him if he so wishes; and, moreover, it will enable him to determine more accurately than ever before the value of the staff he is employing in his district, because he will be able to value them according to the percentage of results obtained by each man from the possibilities that are put up to him to handle.

With this brief introductory, I will ask Mr. Holland to put before you a general outline of the scheme on which he has been engaged. I may add that in the course of this inquiry into how best to give service to members in sales organization, it has become evident that much service can also be rendered to the industry in expert advice on modern business methods—on account-keeping on labour-saving lines, costing systems, wages calculating systems, store-keeping accounts, the use of card indexes and loose-leaf ledgers, filing systems, the tabulation and the charting of statistics, and the use of office machinery of the most up-to-date kind. I believe it would be regarded as a valuable piece of service for the industry if managers were enabled to get expert advice upon this side of the business as well as upon the selling side; and we hope to be able to offer this dual service to managers. These new schemes will, of course, have to be paid for according to the service rendered. It would not be possible to give such service in return for the annual subscriptions, without crippling our already too small publicity expenditure; but it will not entail a heavy expenditure upon any undertaking to get expert advice of the kind indicated.

Mr. Holland then read his paper as follows:

Introductory.

I do not propose to talk about any phase of the gas manager's work, except that of selling gas. I am not here to give a lecture; I am here simply to talk business—to outline a scheme which many practical men think will prove a very real help to all busy managers in securing that all-important thing—an increased output. And what I have to say represents the sum-total of what those practical men have contributed to the many-sided plan which is to be laid before you to-day.

It would be taxing your patience unduly if every detail were laid before you here; and therefore it is thought best to give you a broad outline of the principles upon which the scheme is based in the hope that sufficient will be said to induce you individually to make a closer inquiry into the detail in your several offices, and with reference to your own local conditions and requirements.

Need for Organization.

The need for organization is greater to-day than ever. We are faced, as our Chairman pointed out, with the necessity for meeting an increasing wages bill and a decreasing working day; and I suppose it is fair to say it is exceedingly unlikely that labour will willingly forego, in the near future, these higher wages or the shorter working day. Recognition of this fact has led a great many business men to investigate the question of production so that they may be in a position to pay these high wages, and at the same time keep down the prices of the goods they are selling. In other words, employers are now, in many cases for the first time, investigating very closely the question of unproductive labour—wasted time, and unnecessary effort. Study any business magazine, and you will find that articles are appearing on "Scientific Management" (a plan formulated by Wimslow Taylor to increase production by the application of brains to manual labour by scientific means), on "Organization," on "Motion Study"—the study of motion with the object of eliminating superfluous movements, so that the total operations are reduced, and labour is conserved. The same principles can be applied to selling gas, if we can reduce the time spent in obtaining new business, if we can reduce the cost incurred in obtaining new business, nothing but good can result to the undertaking and to the industry at large.

Weakness of Individual Canvassing.

We have all been struck, no doubt, by the wastefulness of individual canvassing; I mean canvassing in its pure meaning, knocking at door after door for orders. A man makes a number of calls upon non-consumers; but in a very small percentage of cases, he awakens interest and obtains orders. In the great majority of cases, no result, no material result, is secured; and all such calls are a sheer loss to the Company employing him. Furthermore, the whole thing is exceedingly haphazard, the manager sits in his office, and the man calls on the customer, the former has no control over the latter, and the latter does his work as he, the less efficient of the two, thinks best.

The same state of affairs used to exist in a factory. The mechanic working at a machine did his work, the actual performance of a given task, as he thought best. In the modern factory, the management plans, and instructs the man how to do his work.

Need for Organized Effort.

There can be no doubt as to which of the two methods is the more successful. Brains applied in a scientific way, even in relation to the most ordinary task, always produces a greater result than when labour is left to its own devices, and that is one of the basic principles upon which this scheme for increasing output is based. We set out deliberately to find some method which would enable a manager to sit in his office, and control every selling effort made by the undertaking of which he is the executive salesman.

Dependence of Organization on Knowledge of Facts.

Now to control and guide, it is obviously necessary to know first of all what you are controlling, and the goal to which you are guiding it. As sales are to be made, the first essential therefore is to discover where sales can be made. Now it is clear that sales can only be made amongst those who need some specific appliances; for unless there is need—actual material need—there can be no possibility of selling. For illustration, if a man is known to be a non-smoker, having no need for cigarettes, it is a sheer waste of time and money to canvass him to buy cigarettes.

The Scheme.

So your Executive Chairman and your Committee decided to investigate the facts; and we set out to discover whether there were such things as material selling possibilities, which we could reduce to a standard record as a basis for all selling effort promoted by an undertaking.

How Selling Possibilities can be Demonstrated.

We discovered them. We discovered them by simple logic along these lines. All undertakings are enclosed in clearly defined boundaries, such areas are composed of buildings, buildings are composed of rooms, in the rooms are fitted certain appliances which consume gas, and by the simple process of observation and deduction, the rooms themselves demonstrate gas-selling possibilities.

It is a fact that every undertaking in the country can be subjected to a census—such a census to establish for the benefit of the undertaking every selling possibility that exists within its area. And, furthermore, if such a census were conducted, the manager of every undertaking in the country would have such a record of his selling possibilities that increasing his output would represent no difficulty whatever to him.

I quite appreciate that it seems at first sight a formidable task to census such an area as that controlled by your Executive Chairman and my chief, Mr. Goodenough. He has at present a matter of nearly one million consumers; and there must be hundreds of thousands of buildings which would have to be examined. But it is not such a formidable task as at first sight appears, for a census can be made according to the local requirements of any undertaking—large or small.

Sixteen Grades of Selling Possibilities.

We are selling at least six propositions—not one, gas.

Gas Cooking.	Gas Water Heating.
,, Heating.	,, Industrial Fuel.
,, Lighting.	,, Power.

The sale of any one of these does not influence the possibility of selling any one or all of the others—always assuming, of course, there is need for any or all the remaining propositions. You may sell gas cooking and still be able to sell gas heating and so on—as a matter of fact we are not concerned primarily with consumers, but with consumption. If you want a simple census, therefore, ask of every building: "Is gas used for—Gas Cooking?...Heating?...Lighting?...Water Heating?...

Industrial Fuel?...Power?" And your answers will establish your primary selling possibilities.

Industrial Possibilities.

The industrial possibilities can be tabulated by establishing the use to which gas is put by the trade practised in each factory in your area of supply. We did this in the course of our inquiry. We investigated over 4000 trades, and established 372 processes in which gas is employed. We have ready for your use a card-index registering every trade with the gas processes for each. This index will prove invaluable in attacking the industrial selling possibilities.

How Records of Possibilities can be Used.

Now the use of such a record: First of all, it would provide you with a basis for all your canvassing. It would provide you with what you no doubt feel you need, and that is the opportunity to tell what you know is the best story for gas to every person who lives on your area, and who is not yet using gas for all the purposes to which it can be put.

Attacking Possibilities of Both Kinds.

Furthermore, instead of twenty calls a day by a canvasser you could make 20,000—every message designed for the particular person to whom it is intended to interest in gas cooking and everyone of these messages delivered by a postman.

Manager Responsible for Getting Inquiries—Salesman for Selling Appliances.

By this means, you, the management, can obtain your own inquiries for specific appliances and you can use the salesman as he should be used—you can take him out of the class of "door knocker" altogether, by giving him the inquiries you receive, so that he will have a direct opportunity to sell gas for a given purpose at every call he makes.

The gas industry has undeniable evidence of the value of postal canvassing in the result secured by Mr. Creasey—given in his paper entitled "A Campaign Among the Doctors," which he read at your first annual conference. You will remember that over 90 p.ct. of what is admittedly a very difficult class of our public was secured by a combination of postal canvassing followed by salesman's calls.

High Percentage of Results by Employing Scientific Methods.

In any case we cannot but admit that a higher percentage of results must be secured by a combination of manager and salesman, such as that I am endeavouring to interest you in. The management appreciates the number of unfilled possibilities in its area. There is, therefore, direct incentive to salesmanship; and when the salesman knows that the percentage of inquiries turned into orders is recorded to his credit, there must be added enthusiasm, and greater efficiency in your selling staff. The two—manager and salesman—in combination, each knowing what is to be done, and each working with the other, will result in maximum sales with a minimum wastage of time, effort, and money.

The Service.

Subject to your willingness to make a simple record of your selling possibilities, we, of the British Commercial Gas Association, now have a greater opportunity than we have ever had before to assist you individually to increase your output in a gradual, steady, systematic way.

We can supply you with a simple form upon which your own people can supply the standard information which is required. Believe me it will not be difficult to carry out this preliminary work. We, from headquarters, can give you personal assistance, so that everything will work smoothly from the beginning. We can supply you with the necessary record cards together with instructions regarding their preparation, filing, and use, When the preliminary work has been done, we can supply you with canvassing letters delivered to you all ready for issue to those occupying premises where you have established selling possibilities.

I cannot help but say at this point that we do not intend to suggest we can write better selling letters than you. All we are saying is that we can prepare drafts for your consideration and subsequently the canvassing letters can be improved according to their productivity. There is a science of letter writing; but it is a simple science. Write as you would talk were the customer sitting at your desk. Let the letter be all "you" not "I" or "we." Make it attractive. Illustrate your story. We can supply you with something quite out of the ordinary—an illustrated letter, which you will be proud to endorse, and which should, all things being equal, prove very successful. The letter having been approved, all one needs to do is to test it, and finally use the letters that are most productive.

With the canvassing letters we can supply complete selling campaigns for Spring and Autumn; each of these campaigns co-ordinated with the national advertising being promoted by the Association. This co-ordination will mean that we shall all be working to a clear-cut plan, so that the value of every penny spent in press and postal publicity can be secured. One of the things which I think will specially appeal to you is, that knowing what we intend to do to increase our output, knowing what we are hoping to sell, and where we are going to sell it, we shall be afforded an opportunity for definite education in salesmanship.

Training Salesmen.

Now this is of very great importance, particularly as the usual courses in salesmanship are of necessity of a general character. The training of salesmen that is possible in this scheme can be made more practical simply for the reason that salesmen can be trained for the individual campaign the manager is promoting, so that the man may not be "snowed under" with a great mass of instructions it is difficult to apply. Our suggestion is that he should be trained little by little according to the inquiries he is going to handle, until he is ultimately one hundred per cent. efficient in gas salesmanship. No matter what "raw material" you have in your employ, the training can be made so individual, so pertinent, that efficiency is only a matter of time. The salesman cannot help but improve as he gains opportunity to exercise his powers as a salesman.

As a matter of fact we can help you to build-up a selling organization as and when you deem it necessary; and the whole thing can be done little by little, according to your need for it.

Efficiency Records to Create a Satisfied Selling Force.

Another important part of our service will be in the supply of charts upon which you can see at a glance what results your canvassing is receiving, and the efficiency of your salesman.

Personal Consulting Service.

I should like to point out one further part of the service we offer you—a purely personal service between ourselves and you, a service which will be as useful as you care to make it. If you like we can create a clearing house to advise you the whole year round on all subjects connected with the sale of gas. Believe me, we are anxious to give you a really fine personal service—one which will help you in the busy times ahead. We know we can, if you will give us an opportunity to do so.

Conclusion.

One or two words in conclusion—this outline is merely by way of introduction. The scheme is simple in essentials. It can be used for large and small undertakings alike. Both will find it meets their needs. It is adaptable. It is elastic enough to satisfy all the varying local conditions under which you work. I have been talking generally. Will you allow me to talk to you in your own office, upon the detail and upon the scheme as it will help you?

DISCUSSION.

Mr. F. W. Goodenough asked whether he might add a word or two more in regard to what had been said in the paper. Mr. Holland had very generally introduced a scheme that had been worked out; and the details of the scheme could be best explained to managers in their own office. Those managers who were interested in the proposition for helping them to develop better sales organization could, he thought, get the best information concerning it by writing to Mr. Mason, and suggesting a time when it would be convenient for Mr. Holland to run down, and talk over the matter with them. The question of terms upon which service could be given could then be explained. He was sure that many managers would find there was value to the industry in the scheme.

Lieut.-Colonel H. W. Woodall (Bournemouth) said everybody present must have been immensely impressed by the valuable paper to which they had listened; and they would all avail themselves of it to the utmost of their capacity, and would derive great benefit from doing so. But he did want to issue one word of protest. Gas undertakings had received considerable benefit from the Association; and they all appreciated its work. At the same time, they had not been altogether unsuccessful themselves; and they had done something to find business for themselves. Gas officials had also some ideas as to organization, and had endeavoured to work up properly organized systems. He could speak for one Company; and he was perfectly certain the experience of that Company was the same as that of many others. He had a card index for every consumer at Bournemouth, which showed every piece of apparatus fixed. It was started in 1905, and was always kept up to date. No canvasser went out without a card giving all particulars as to what people had in their houses, and what their attitude was towards the use of gas. From this canvassers very often knew what attitude they should take up. They often found out, too, when people were giving up their houses; and a note was made on the card when these houses could be tackled after the consumer had left. It would be seen from this that they had not been sitting still, nor were they all incompetent.

Mr. Goodenough said there certainly had been no intention of making a sweeping indictment applying to every undertaking up and down the country. All that was intended to suggest was that salesmanship had not been organized to the fullest extent in the industry as a whole—not that no gas undertakings had been organized in the sales department. Bournemouth was a leading example of an undertaking that had done much. But there were gas undertakings in the country that were not like Bournemouth in this respect, and it was true that there had been no organized effort to assist undertakings to carry out local sales campaigns on up-to-date lines.

Mr. A. W. Sumner (Grays) spoke of the unsuitability of the literature that was in the first instance sent out by the Association for the class of consumers in a district such as that supplied by his Company. After paying their subscription for some three years, his Company dropped out when the war came on, as they thought they could spend the money in a better way. Just before the invitation came to him to attend this conference, he recommended his Directors, as the industry was likely to be subjected to keen competition, to look at the matter from a national point of view, and for the Company to do their part in helping the industry as a whole. This his Directors agreed to do; and

he had come down to see what the Association were actually doing. He should like to ask whether anything was being done to meet the needs of working-class populations.

Mr. Goodenough remarked that the total membership had gone up during the war at a very great rate. The last year had been the greatest of all in new members.

Mr. Sumner: If I adopt this scheme, have you any literature suitable for working-class people?

Mr. Goodenough: Yes; we certainly have.

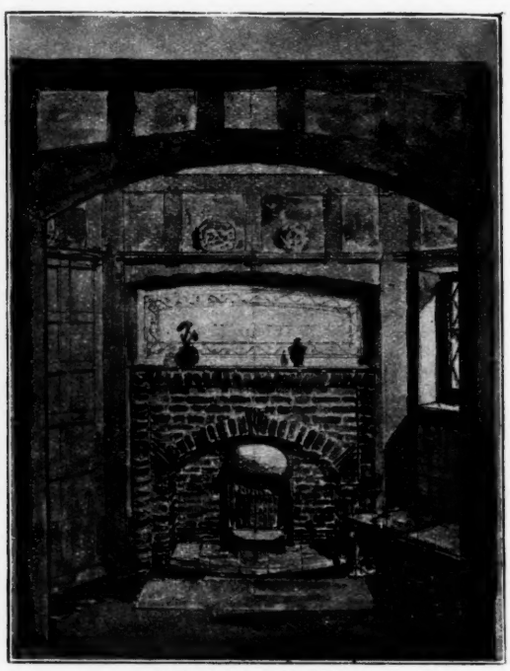
Mr. Mason said the same criticism was made in the early days of the Association, that perhaps the advertisements and literature were appealing rather more to the better class than to others. They had a definite object in doing so. They had since then had booklets prepared adapted entirely to the working class. The Lancashire subscribers made the same point some years ago; and Mrs. Brereton then got out a number of very useful booklets.

GAS SERVICE IN NATIONAL HOUSING SCHEMES.

By W. J. Sandeman, of Croydon.

[A Paper Read at the Southern District Conference of the British Commercial Gas Association, at Reading, on April 28.]

One of the most pressing problems of the day is that of housing, more particularly for the working and lower-middle classes; and it is satisfactory to note that some attempt is being made to solve it on rational lines. Until quite recently, the importance of proper housing accommodation for the working classes has scarcely been recognized; and the majority of cottage homes have been synonymous with every kind of domestic inconvenience.



An Inglenook Fire Place.

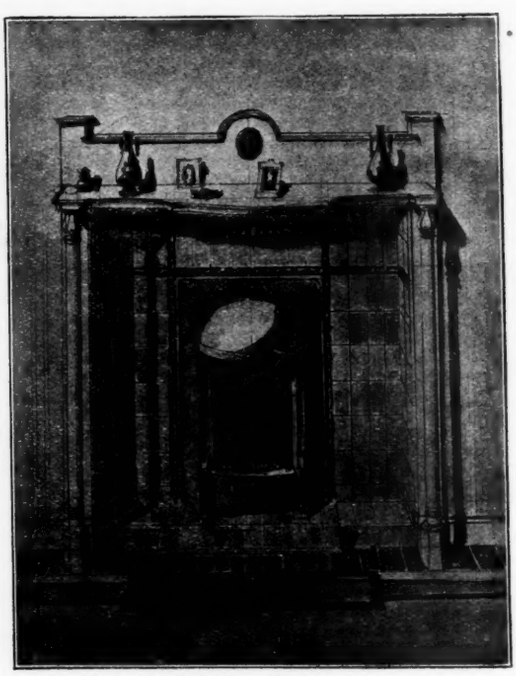
It has also been quite the exception for any arrangements for the use of gas to form part of the original design of the house. Consequently, when installing apparatus, it has had to be placed in any odd corner, frequently at very great inconvenience to the household. The matter is now being taken in hand by local authorities under the Housing and Town Planning Acts; and the designing of the houses will, it is hoped, not be left entirely to the speculative builder whose main idea in the past has usually been to crowd as many houses as possible into the smallest possible space, with little or no consideration for the comfort of the unfortunate occupiers.

Points from the Report of the Women's Housing Sub-Committee.

A very full report on this important question has recently been prepared by a Women's Housing Sub-Committee, appointed by the Ministry of Reconstruction Advisory Council; and it may perhaps be of interest to note a few of this Committee's recommendations in so far as they affect the matter we are discussing to-day. It is suggested that the superficial area of the house should be increased beyond that which was usual in the past, and that houses should be limited to ten to twelve to the acre. Solid fuel should, as far as possible, be dispensed with, not only for the purpose of saving labour (although this is, perhaps, the primary reason), but also for the sake of keeping the air of our towns as free as possible from smoke. In this connection, it would not be out of place to quote a paragraph which appeared in one of this morning's papers. In commenting upon the vagaries of our climate, it says:

> It may interest some to know that Sunday snow in London has the advantage of being a great deal cleaner and purer than snow which falls on a week-day. An analysis made some years ago showed that Sunday snow had only one-fifth of the impurities present in Monday snow. In the matter of sulphuric acid, Sunday scores very heavily. In 10 lbs. of week-day snow as much as 3·36 grains of the acid were found. In snow that fell on Sunday, there was practically none—eloquent proof of the purer state of the air when fewer fires are burning.

The report of the Women's Housing Sub-Committee also emphasizes strongly the necessity for a regular and efficient hot water supply. It has taken a very long time to awaken us to the fact that no housewife can hope to keep her family and her home clean and healthy unless she has at her disposal, in winter and summer alike, an adequate supply of hot water. It is true that some—though I doubt if very many—of the working-class homes possess the usual kitchen range fitted with boiler; but I think it will be found that in the large majority of cases, owing to the labour it involves and its extravagant consumption of fuel, the range is rarely used, except in the coldest weather, when the fire is required more for warmth than for any other purpose. During the major portion of the year, the cooking of the household is performed on the gas-cooker, which is at once more convenient and economical than the coal range. The usual type of gas-cooker does not, however, provide any method of obtaining a constant supply of hot water. It is also recommended that what is usually known as the kitchen should be made into a parlour or living room, and that the work of the household, so far as cooking, &c., is concerned, should be concentrated in the scullery. This is, undoubtedly, a very excellent suggestion, provided the scullery is of ample dimensions.



A Bed Room Fire Place.

The report contains many other recommendations; but as they are outside the scope of our discussion, I do not propose to deal with them in these few notes, but merely to touch very briefly on the use of gas in the home as a means of saving labour. I may, perhaps, add that the Committee appears to be obsessed with the idea that electricity is the solution of all domestic problems, although it expresses the opinion that, owing to its present cost, the time is not yet ripe for its introduction into the working-class home. Consequently other labour-saving methods of cooking and heating must be considered. The time is, however, far distant when electricity will be able to compete, to any serious extent, with gas as a fuel. On the question of cost alone, electricity would require to be distributed at approximately ½d. per unit to compare with gas at an average cost to-day of 4/- per 1000 c.ft. The Committee has also entirely overlooked the fact that, however desirable it may be from some points of view to adopt electricity as a fuel, from the National point of view, it would, as Lord Moulton has said, be a "ghastly waste" of the country's coal resources.

Type of House.

The type of house which it appears is most needed at the moment is one containing a parlour, or living room, a scullery, in which the cooking, &c., is to be carried out, two or three bedrooms and a bathroom; and, in my own area of supply, I have

already been discussing the preliminary arrangements for over a thousand houses of this type. The system advocated could, of course, be adapted with very slight modifications to larger houses, and would tend to solve to a great extent the domestic servant problem.

Lay-out of Estate.

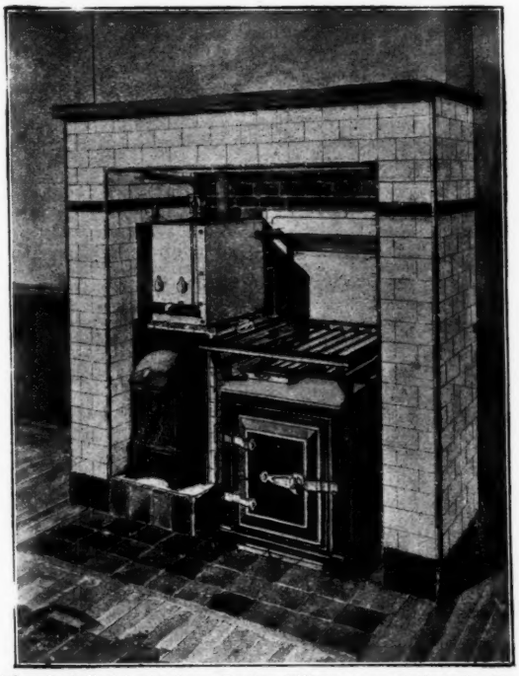
In the first place, in laying out the estate, arrangements should be made for gas mains and services of adequate size, to meet all possible prospective requirements; and these should be laid before the roads and foot-paths are completed. The internal piping should be of adquate dimensions, and should be fitted and tested while the houses are being constructed. This work should be carried out by the gas undertaking, or at any rate under its supervision. Provision should be made in all rooms for gas heating. Meters should be fixed in easily accessible positions, so that consumers may be encouraged to read them, and check the consumption regularly.

Artificial Lighting.

The artificial lighting should be carried out by means of inverted incandescent gas-burners, which is the cheapest and most efficient method of lighting. In Croydon, with gas at 3s. 11d. per 1000 c.ft., and electricity at 8d. per unit, gas lighting is less than one-third the cost of electric lighting; and, on the question of renewals, there is a still larger margin in favour of gas. In the case of the larger houses, this may not be such an important point; but in the smaller houses the question of cost is one that must be considered.

Cooking.

As the work of the house, or perhaps the bulk of it, has to



Kitchen installed in Norbury Garden Village, except that the Copper is omitted.

be carried out in the scullery, the floor should be tiled, and a tiled ventilated recess constructed in which to place the cooking-stove and water-heating apparatus. The cooking should be carried out entirely by gas. No provision should be made for using solid fuel of any description for this purpose; and the ventilation of the recess should be such as to prevent any smell of cooking operations permeating the house. In designing a house, this should be a comparatively simple matter; and it is one that would add greatly to the comfort of the occupants. This plan has been adopted with very great success in the Norbury Garden Village where the houses, which are of a larger type, are fitted with "All Gas" kitchens. The tiled recess is ventilated into a chimney, and contains a gas-cooker, a gas-heated circulating boiler, and a gas-fire. On the outside of the recess, but ventilated into it, is fitted a gas-heated washing copper. In the living rooms and bedrooms, gas-fires are fitted. With this combination of gas appliances, the work of the household is reduced to a minimum, and is readily carried out by one servant.

Domestic Hot-Water Supply.

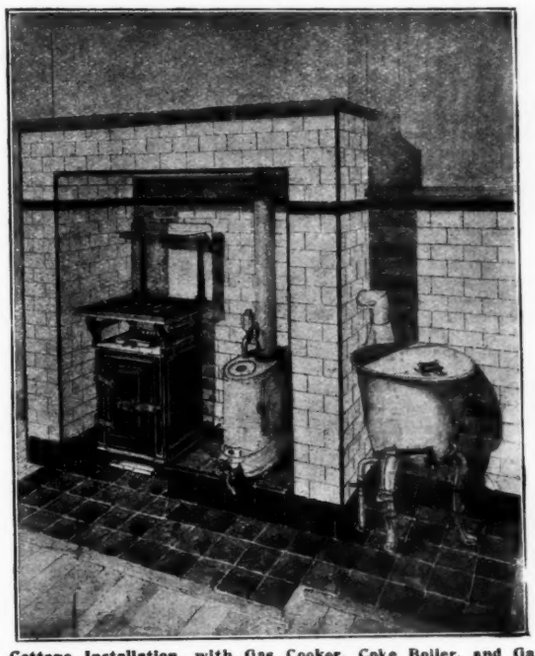
The next point to consider is that of domestic hot water; and it is essential that there should be an ample and constant supply. The cheapest method of obtaining this is by means of a coke-fired boiler. Although a boiler of this type involves a little more dirt and labour than a gas-heated circulating boiler, I think it will prove more acceptable to the tenants of the smaller houses on account of its economy; and for this reason I have recommended it for the particular houses with which I am dealing. A coke-fired boiler can be maintained in constant use with a very small consumption of fuel; and, moreover, it can be used for destroying practically all the household refuse—thus doing away with the insanitary, and in many ways objectionable, dust-bin. In the larger type of house, there is no doubt that the gas-heated circulating boiler will be preferred on account of its cleanliness and convenience. The boiler should, however, be fitted with a thermostatic valve for automatically reducing the consumption of gas when the water reaches a predetermined temperature. A cut-out valve should also be fitted to the hot-water cylinder or storage tank, to allow a small quantity of water being quickly heated during the day for domestic purposes. I would here urge most strongly that, whatever be the form of fuel used, the cooker and water-heater must be separate appliances. It is a fallacy to suppose that hot-water can be obtained from "waste-heat" even in an old-fashioned coal range. Such waste heat always absorbs fuel that could be better utilized.

Incinerator.

A gas-fired incinerator, several types of which can now be obtained, for the destruction of household refuse, will be found a useful adjunct to the gas-heated circulating boiler, as the only satisfactory method of dealing with refuse is to reduce it to ash.

Gas-Heated Wash Copper.

There is another hot-water apparatus that the housewife will do well to have in her scullery, and that is the gas-heated wash copper. It is cleanly, easy to manage, and involves far less labour than the ordinary solid fuel type of copper. It is suggested that the copper be placed outside the recess in which the cooker and boiler are fixed, but connected to the same flue.



Cottage Installation, with Gas Cooker, Coke Boiler, and Gas Washing-Copper.

Gas-Heated Iron.

A constant companion to the wash copper is the gas iron—an equally convenient appliance, which may assuredly rank among household "labour-savers."

Heating of the Parlour.

We now come to the parlour, which is to be the living room of the household, and which will require to be continuously heated during the winter. Here I think it is desirable to instal an ordinary coal fire. The back of the grate might, with advantage, be fitted with a small boiler, independently connected to the hot-water cylinder or storage tank, to augment, and at times take the place of, the scullery boiler. It will be found most convenient, and, at the same time, economical, to have a gas supply laid to this fire-place to allow of a gas-fire being fitted for intermittent use during the cool days of spring and summer.

Heating of Bedrooms.

In the bedrooms, where intermittent heating only is required, it is proposed to substitute for the ordinary fire-place a tiled recess in which to place a gas-fire. The hearth should also be tiled and raised about 3 to 4 inches above the level of the floor. I think it is apparent that this is the most desirable and economical method of heating a bedroom, and much to be preferred to the usual unsightly practice of fixing a gas-fire in front of an ordinary coal grate. With this latter method of fixing, particularly in the smaller type of house, the fire not only projects too far into the room, but a most inaccessible dirt-trap is formed, which it is impossible to cleanse without disconnecting the fire.

By the introduction of gas heating into the bedrooms, some considerable saving can be effected in the cost of constructing the chimneys, as they can be of smaller dimensions than is usual with the ordinary coal fire; and the expense of providing a coal grate, to be afterwards superseded by a gas-stove, is avoided.

Maintenance.

The final point to which I desire to call attention is that of maintenance. It is little or no use installing all these appliances unless we are prepared to efficiently maintain them. A badly adjusted burner, a broken mantle, or a gas-fire with broken radiants is the worst possible advertisement for gas; and it is, therefore, desirable in our interests as well as those of our consumers to keep all apparatus in proper working order.

DISCUSSION.

Mr. J. W. Walker (Maidenhead) asked whether any member had had practical experience of keeping appliances in order. The paper to which they had just listened suggested the desirability of this. Of course, they all knew that a broken mantle and defective appliances were the worst enemies of gas suppliers. It was all very well to advertise the excellence of gas, when a burner out of order before the consumer's eyes neutralized everything they had to say. Could any figures be given as to cost?

Mr. D. H. Helps (Reading) said he could only speak of the system adopted at Reading and in many other towns. That was to make a small charge for looking after incandescent burners; and this would pay any company even if they had to keep up the price of gas by 1d. It would not cost as much as that—½d. would do it—to encourage the system of maintenance, with a small charge per burner to the consumer. In Reading they had maintained thousands of burners in this way. It had been rather difficult during the war to keep the burners in order, because the maintenance-men had had to go away. It should be their aim to give service to the consumers. It was no good supplying an excellent commodity, unless the consumers were instructed how to use it to the best advantage.

Mr. W. L. Westbrook (North Middlesex Gas Company) said he should like to emphasize one or two points Mr. Sandeman had brought out. The Association, he knew, were doing good work in connection with the housing schemes. With regard to cooking, he agreed that the scullery was the place for the gas-stove, and that they should have a tiled recess. Hygienic conditions were talked about a great deal in the gas industry; and it was up to gas undertakings to get them in these new schemes. They would be serving their best interests in so doing. The person who should be approached was the architect, because they should get the necessary provision made upon the plans. Proper ventilation should also be arranged for; and the hot-water apparatus, with the gas-copper, should be fixed adjacent, so that the whole of the products could be taken off by the one chimney. He should like to suggest also that as a coal fire was necessary in the living-room at least in the winter months, the scullery flue should back on to the flue in the living-room, so that the hot-water apparatus in the living-room could be interconnected with the gas-copper. In houses for working-class people, they would not want a living-room fire and a coke-boiler as well. Personally, he thought it better to put in a combined gas and coal apparatus, so that they could use the living-room boiler as well—thus employing gas in the summer, and no solid fuel at all. In the London district, the sculleries in some of the houses were not big enough to put in a gas-cooker. In some modern houses, the sculleries were not larger than 8 ft. by 10 ft., which was ridiculous where people had to do a lot of work. The space was quite inadequate. In the Roe Green gas installation, it would be noticed that the gas-cooker had been put under the window, quite remote from any flue whatever, and that the position of the cooker and the hot-water apparatus was as far as possible away from the fire in the living-room. As to the tiled recess and surrounds for bedrooms, it was great waste of material, time, and money to put coal grates in bedrooms in any class houses. These were points which should be emphasized before the authorities prepared and finally passed these schemes.

Mr. H. H. Creasey (Gas Light and Coke Company) agreed with many of the points made by Mr. Sandeman, as well as with those made by the last speaker. It was wise that they should point out to housing committees, and to a good many people who were looking forward to all sorts of magic which they thought would be accomplished by electricity in the future, that they could do practically all these things by gas. It seemed to him that these people were searching for all the finest apparatus they could find, and rightly, if what they sought was really practical and really existed. But they must beware of pursuing a will-o'-the-wisp up a blind alley. As to the points about Roe Green, and so on, he had appeared before the Women's Advisory Committee, to whom Mr. Sandeman had referred. As regarded the tiled recess, it would be rather curious to those present as it was to him, to find the Women's Advisory Committee were dead-against it. They did not agree with it at all. What gas men thought was a hygienic thing, the Committee said was not. They said that with the tiled recess, the housewife would never keep it clean behind the cooker; but with a plain wall they would be able to clean right round the cooker. He thought the recess a fine thing; but the Committee were against it every time; and they had had many housewives from the working class before them. As to the size of the scullery, this perhaps did want to be larger, in order to permit all the things to be put into it which they, as gas men, thought should be placed there; and the Women's Committee advocated a large scullery. But it must be borne in mind that the recess increased building costs, and the ground area on which the scullery stood. Mr. Sandeman spoke of a living-room or parlour. He (Mr. Creasey) thought that the experts favoured a parlour as well as a living-room; and therefore, of course, they could have a gas-fire in the parlour for intermittent heating, because they would retain a coal fire in the living-room, which would answer the purpose of heating the room and doing a certain proportion of the cooking in the winter; and, if there was a back boiler, it would heat water. In the summer the whole of the cooking could be done by gas. Why he said a certain proportion of the cooking was because there had been a good amount of consideration given to solid fuel grates of the type similar to the "Inter-oven," which had hobs at the sides for saucepans and an oven for cooking, where the canopy was usually found, with a back boiler for heating water. Regarding Mr. Westbrook's point *re* Roe Green, when the installation was under contemplation, the authorities did not consider joining the water heating up to the coal fire because there they had gone for gas cooking and gas water heating solely without troubling about water heating from a coal-fire boiler. As to electricity, he thought it should be borne in mind that, while they were waiting for these super-generating stations (and they did not agree that, if and when they were built, they would economically compete with gas for cooking, heating, and water heating), the housing schemes could not be held up. If the housing schemes had to wait for the generating stations, then few would be built for some time to come; and the materials and labour required for the generating stations could be better utilized in building houses. Another warning should be given to the Housing Committees and the Government officials—that was as to freak or hybrid appliances. Mr. Sandeman had recommended that the cooker and water-heater should be separate appliances, with which he (Mr. Creasey) was fully in agreement. Even the Women's Advisory Committee seemed to him to favour in many ways what might be called freak appliances. They appeared to be anxious to find out something that would do two things at once. If an appliance was properly designed to carry out its original project, it should be all right for that purpose, and nothing else. If they supplied the houses with the finest and most efficient example of cooker they could find, then, if the housewife found out some other way of making use of it, well and good; but a gas-cooker should be a cooker and nothing else on earth. Then came the question of the cost of putting in these comprehensive gas installations. If it was intended to put them in, it would mean money. They would not come within the scope of an ordinary prepayment installation. There was no doubt about this. Putting in gas heating and water heating would cost a much larger sum per house. In his opinion, they ought to ask for the sympathetic consideration of the housing authorities in bearing as much of the cost as possible of the things that would help the housewife to get the conveniences and hygienic advantages the authorities desired her to have. If they did not do this, it seemed to him the cost would either fall heavily on the gas undertakings, or the apparatus would not be installed, because the extra pence charged per 1000 c.ft. to the prepayment consumer would certainly not cover these comprehensive schemes. If they could get the authorities to spend money liberally in order to provide the tenants with what they were asking for, his suggestion was that the undertakings might consider among themselves as to whether they could in approved cases reduce the number of pence per 1000 c.ft. to the automatic consumers by special arrangement with the housing authorities, and the charge of so many pence per 1000 c.ft. should cover maintenance to the fullest possible extent, while mantles should be paid for by the tenants when required, and actual repairs to apparatus by the housing authorities as the landlord would to solid fuel apparatus in the ordinary way. When discussing these things with the Women's Advisory Committee and the architects he found they had some doubts as to whether the tenants' pockets would permit of their paying for gas at the usual prepayment meter price, if gas were used for water heating, for cooking, and for room heating. With regard to the coke-boiler, some certainly seemed to think there was a possibility in that. He agreed somewhat with the last speaker that, if they were going to have a living-room coal fire in the winter, they must not expect the housewife to keep a coke fire going as well. They would probably need the two at the same time; and if in the summer they required a continuous supply of hot water they would find they would have to keep the coke boiler going, which they would not like. A coke fire required labour; and the housewife did not want to increase her labour. The ideal system would seem to be a coal-fire boiler in the living-room in the winter; and a gas water-heater of the combined boiler and storage cylinder type fitted in the scullery, joined up to the living-room fire, so that in the summer gas would be used when the cold water was at a high temperature, thus costing less to heat, and in winter the coal fire would do the whole thing practically, except for breakfast cooking or other small things. But the waste of a coal fire burning continuously in the summer was very great. For then providing the small quantity of high-temperature water required for washing-up or cleaning floors, &c., and a larger quantity of lower temperature water for baths, there was nothing more economical than the gas water-heater and storage cylinder combined. The Women's Housing Committee mentioned a special gas water-heater which they recommended, after having seen it in use at the Rowntree Garden Suburb at York. They remarked that the claims put forward for this heater had been more than borne out by the users in practice. This was almost the best thing they said about gas in the whole of the report, though they did practically say that gas-cookers should usually be fitted, and possibly a gas-fire in the living-room. He (Mr. Creasey) felt some diffidence in referring to this heater, because he had had a good deal to do with its perfecting. Mr. Swain, the architect of the Rowntree Garden Suburb, had the beginning of the idea; and he made a rough model. The model had been materially altered and improved since; and the result was what the Women's Advisory Committee had so highly spoken of. The apparatus was designed from the point of view that for every time a bath was needed in a working-class household, there were many times every day when (say) a pailful of very hot water was needed for washing-up, &c. The apparatus was therefore designed so that 1 gallon or (say) 5 quarts of water could be rapidly heated with low fuel cost, and no circulatory action took place during this operation; and when a bath was required, a valve was opened, and circulatory action took place, and sufficient water for a bath was heated. The apparatus was also unique in this way—it was a combined boiler and storage cylinder with a total capacity of about 14 gallons. Hitherto so far as they knew, there had not been an apparatus made with a storage lower than 20 gallons; and there were some bye-laws in some cities and towns which restricted them to a storage of no lower than 20 gallons. But such bye-laws would probably be amended. It was considered by the housing people that for the supply of a bath for the working-class houses, the amount of

water that would be required would not need such large storage as had previously been fitted in the average house; so they aimed at a lower storage, with the possibility of getting water at a high temperature, and diluting it with cold. It was calculated that the new apparatus would give 14 gallons of water in thirty minutes in the summer and 40 gallons in winter at an average temperature of 130° to 135° Fahr. When diluted sufficiently with cold water, they could get about 100° Fahr. for an average bath. The water could, of course, be made hotter if the gas was kept going longer. As to bedrooms, it seemed to him they should try to persuade the authorities not to put in the ordinary coal-fire chimneys, chimney breasts, or coal grates. All that was required was to make a tiled backing as suggested by Mr. Sandeman, and to leave where possible a space in the thickness of the wall—say, one brick in area, 9 in. by 4½ in.—for a ventilating shaft for the gas-fire, and to put a cheap and plain wooden surround to act as a mantel, and then fit a built-in type of gas-fire against the tiling. This would save in the cost of the building, by eliminating or reducing the chimney breast, and give more floor space in the room. The gas industry must not forget these houses were going to stand for a long time; and if the gas appliances were not got in now, there might never be another chance. When gas undertakings were discussing and considering the putting in of these comprehensive installations, it seemed to him, they ought to aim high in this direction, because the working class were getting more prosperous every year and could usually afford to have them.

Mr. F. W. GOODENOUGH asked whether any calculations had been made as to the cost of putting in coal appliances as they would have to be normally put into these housing schemes, and leaving them out and putting in gas appliances on a modern system. Was there any material difference in the cost of construction in the first place? And was there any reason why the builder should not bear the whole cost of the gas installation?

Mr. CREASEY said, so far as he knew, there had been no investigation of comparative costs. If the matter was gone into carefully, they would probably prove that any installation of gas they would like to put in would not cost more than if provision was made for suitable solid fuel appliances, and these were installed instead.

Mr. W. HIGGS (Basingstoke) said the financial aspect to gas companies of this housing problem was an important one. Of course, the cost of these appliances would mean, in a large number of cases, a very considerable capital outlay to the companies. He had no doubt the question had occurred to many that afternoon, as to how they would get this capital. This was one of the most serious questions that faced the executive of a gas company at the present time. How could they expect to supply the necessary capital for this exceptional outlay when they were only able, through the operation of the sliding-scale, to pay part of the standard dividend. While there was on the part of everybody the keenest disposition to do everything from the national point of view, and in the interests of the public generally, they had to face this fact that there would be considerable difficulty in obtaining the necessary capital.

Mr. W. W. TOPLEY (Croydon) said he should like to emphasize the extreme urgency of the problem. The position was perhaps unique in the history of the gas industry. They were just on the threshold on the part of the nation of catching up the work of five years when they were faced with the recognition of the question on all hands that the character of the buildings of the future must have more regard to the reasonable comfort of the smaller householder than had been the case in the past. The opportunity which lay before the gas industry in connection with the projected building, in the next year or two, of many hundreds of thousands of houses of quite a new type, was one which, if lost, would never recur in the lifetime of anyone in that room. The financial aspect was probably one that was at the back of the minds of most men connected with the industry; and it was, of course, one of very great urgency, because there were so many directions in which capital outlay would be most necessary, and would be pressed in the early future upon those responsible for the administration of gas undertakings. They could not lose sight of the fact. But he ventured to suggest that an answer was supplied by the discussion that had gone before. They were not asked to spend money on existing buildings; but the question was whether money was going to be spent, on buildings that were going to be put up, in the direction of adapting a most cleanly fuel or in equipping them for solid fuel, with the subsequent waste to gas companies in readapting them for the use of gaseous fuel. He believed the urgency of the matter was in the direction of getting into touch in every district with the authorities who were getting-out these housing schemes, and putting before them at once in adequate form what could be done by a fuel such as gas. If anything was attempted, it would have to be in the early future. The question had also been raised as to whether for water heating, gas only should be used, or a combination of gas and solid fuel. What was immediately in front of the country was the erection of a large number of houses for the working classes. It had been said the working classes would be better off hereafter than in the past, and so better able to afford what they could not before. In a measure, this was true; but they must remember too that, although the wages of the working classes were about double, the value of money was only half. This proportion was not likely to alter at an extremely rapid rate. He believed, therefore, that considerations of domestic economy would still have to be in the minds of the wives of working men; and if those who were designing the working class houses were wise, it would be in their minds also. He thought there would be a demand on the part of the working man's wife for the conveniences given by a constant supply of hot water. If this could be assured to the wife of the working man, no less than to the wife of the wealthier or middle-class householder, it would be a great boon. He was inclined, from all he had been told, to believe that to attempt to get a twenty-four or even twelve-hour a day service by gas alone was a rather more costly thing than the average working man was likely to be able to afford; and he therefore thought that in the small houses provision should be made by efficient and economical means of using solid fuel such as coke for securing an ample supply of hot water. This would have a reflex action in ensuring to the gas undertakings the use of gas for cooking, wherein gas was no doubt supreme. It might be possible, and at no great expense to provide, in addition to the use of coke or anthracite for getting a constant supply of hot water in the winter, to make provision by gas to obtain moderate supplies of hot water in the very hot weather without the use of a circulator. However this might be, he believed that the use of gas for cooking and most of the heating, and the use of coke for an ample supply of hot water would in the long run be most beneficial to gas undertakings, and most beneficial to the comfort and the pockets of users of gas in small houses.

Mr. SANDEMAN observed as to the enormous costs that were likely to fall upon gas undertakings in connection with these schemes, that the fact was rather overlooked that, in the majority of the houses, it was the intention of the owners to put in and build a tiled recess in the scullery and provide a coke-boiler for water heating or a copper. They would also provide the tiled recesses in the bedrooms; but the tenant would have to hire the necessary gas-cooker and fires. The piping would be for the builder; and no great expense would fall upon the gas company. Regarding the village installation to which he had referred in the paper, the apparatus was going to be rented from the Croydon Gas Company by the owners of the property. The rent would be for a gas-cooker, gas-fire, and gas-boiler, which would be fitted in the recess; and the copper would be provided by the builder at his own cost. The rented apparatus would be on simple hire, and would remain the property of the Gas Company, who would look after it. Ordinary meters would be used, as they were fairly large houses. The houses now being erected were much smaller. They were superior working-class homes; and it was the intention of the owners to provide all the apparatus with the exception of the gas cooking-stoves and the gas-fires for the bedrooms, which would be hired by the tenants. He should like to supplement the remarks of Mr. Helps with regard to the maintenance. The Company had had this system in operation for some years now. Their practice was to provide the labour free, and to charge for the materials supplied. Their costs came out at about ¼d. per 1000 c.ft.; and they had 25 p.ct. of their consumers on their books for maintenance. This was before the war. It only referred to lighting; the maintenance of the other apparatus was done free. One point raised by Mr. Creasey was as to the objection of the Women's Sub-Committee to the recesses. He (Mr. Sandeman) thought that this must be due to the recesses having been made too small in many cases. They should be made large enough to get at the side of the stove, instead of the stove being jammed against the side wall.

Mr. CREASEY said that the difficulty was to persuade the housing authorities and the architects to provide a recess as wide and deep as the Women's Committee would like it to be, so as to get right round. They would rather not have one at all if they could not have it wide enough, and deep enough—indeed, they preferred a flat wall where the dirt could readily be seen.

Mr. PHILBRICK (Reading) asked whether information could be given as to the hygienic value of gas and its effect on plants, &c.

Mr. SANDEMAN replied that it was frequently claimed by electricians that the use of gas for lighting vitiated the air of the room; whereas the small amount of heat given off by the incandescent burner actually assisted in the ventilation of the room, and the air was prevented from becoming stagnant. In smoke rooms where the gas was used for lighting, the air was kept much better than where electricity was employed. The heat from the gas materially assisted in the ventilation.

Mr. GOODENOUGH said it would be in the recollection of the members that Dr. Rideal, the well-known Research Chemist, carried out research work extending over two or three months, from which experiments on human beings—occupying identical shaped and conditioned rooms, on one side lighted by electricity and on the other side by gas, he found no physiological or hygienic difference between the two systems. The result of his researches was published in the "Journal of the Royal Sanitary Institute." They dealt fully with blood and other tests that were made, and which showed clearly that, from the point of view of hygiene, there was nothing to choose between the two methods of lighting. If anything, any difference was in favour of gas. Those tests had never been challenged.

Mr. CREASEY said as to the effect of gas upon plants, the Royal Botanical Society some few years ago decided to put in a modern gas installation for lighting after they had fully considered the claims of both gas and electricity. They felt that the effect upon plants was rather beneficial than otherwise. As to the supply of gas grates or fires to bedrooms, he understood from Mr. Sandeman that these would be hired by the tenants. This was really one of the points he referred to when discussing expenditure. He thought they should endeavour to get the housing authorities to put these in at their cost rather than ask the working-class tenants to pay rent for them. When the tenant came in, it might be very hard to get him to hire gas-fires for the bedrooms. They might provide the tiled backing and so on; but the tenant might say: "I do not want to provide these things myself, and will not have them." If they could get the housing authorities to put them in, the tenants would be satisfied, and would find in their bedrooms the finest possible thing—a good gas-fire.

Croydon Gas Company's War Effort.

The "Croydon Co-Partner" says that the Company were one of the first to re-arrange their apparatus so that the "C" process for augmenting the content of useful materials in their tars could be applied. Between May 8, 1915, and Sept. 17, 1917, 1,250,000 gallons of special tar were produced, in which the increase of useful content is represented by: 14,144 gallons of benzol; 4192 gallons of toluol; 3686 gallons of light solvent naphtha. On Aug. 28, 1917, plant for the extraction and recovery of crude benzol from the Company's coal gas was put into operation; and between this date and Nov. 25, 1918, the plant produced for the Ministry of Munitions crude benzol representing: 46,500 gallons of benzol; 8592 gallons of toluol; 17,907 gallons of solvent naphtha. As a matter of interest, the total weight of benzol produced in these two plants was 527,602 lbs., equivalent to 255 tons of synthetic phenol, which, converted into trinitrophenol, would give a yield of 500 tons of picric acid, or lyddite. The total weight of toluol produced by the two plants was 111,220 lbs., equivalent to 110 tons of trinitrotoluol (T.N.T.).

SUNDERLAND CONFERENCE OF THE "B.C.G.A."

A Conference promoted by the Northern District Committee of the British Commercial Gas Association was held last Friday afternoon in the Lecture Hall of the Subscription Library, Fawcett Street, Sunderland.

The Mayor of Sunderland, Alderman W. F. Vint (the Chairman of the Sunderland Gas Company), presided over a large attendance. He extended to the Association a very hearty welcome—more especially as he believed it was the first time the town had been honoured by a visit from the organization. The tide of industry ran very deep and strong in the borough; and there were signs of marked progress. He hoped a great deal of good would result from the conference. He knew the objects of the Association, and particularly that of making certain that members of the gas industry could satisfy their customers. He had the honour of presiding over the Sunderland Gas Company, one of the earliest gas undertakings to join the Association; and it had supported the Association to the utmost of its power. Those present had probably read in the newspapers that everything was in the melting-pot, gas included. He remembered that some of the old men in the gas industry shook their heads when the incandescent gas-burner came along. They said that only half the amount of gas would be required to give the same amount of light as hitherto. Well, it had happened that since the installation of incandescent burners—he spoke at all events for his own Company—the output of gas had been at least doubled. He spoke of the great increase of gas-fires in Sunderland, and said that gas-engines could be counted in the town by the hundred. He had every reason to believe that the brain-work put into the gas industry would go on developing, and so make gas more and more useful to Society, and more productive and more advantageous to those having the gas industry at heart.

The Work and Policy of the "B.C.G.A."

Mr. F. W. Goodenough, the Chairman of the Executive of the Association, gave an address on its work and policy. He said the Association could not truly serve the permanent interests of the gas industry unless it truly served the interests of the public. They were in a special sense public servants, entrusted with certain monopoly rights which entailed consequent duties. The business of the Association at this time was to assist in helping forward the gas undertakings which supported it. The Association included all the principal municipal gas undertakings as well as gas companies, and represented 83 p.ct. of the gas made in the kingdom. It was the Association's business to reduce the work and thought and worry entailed in developing new and additional business by making it easy for its members to initiate and carry out local plans of campaign for extending the use of gas and coke, as well as, on their behalf, conducting with the same object a national campaign such as no individual undertakings could undertake separately. It was the Association's business to be the sales organizer for the industry. The Association supplied the public regularly with reliable information concerning the questions of light, power, and heat—questions which affected every home and every business. The Association had done a good deal to awaken public interest in the advantages to the health of the nation that accrued from using, in the place of crude coal, its purified essence—gas—and the smokeless bye-products of its carbonization—coke. It had also worked to make the rationing of gas supplies as equitable and as little attended by hardship as possible. The public had been led to believe, as the result of certain one-sided reports on coal conservation, that the panacea for all or most of the difficulties in regard to the questions of housing, transport, and coal conservation, was to be found in the general use of electricity, not only for light and for motive power but for all fuel purposes. This—not to put too fine a point upon it—was absolute nonsense, and was so regarded by all well-informed electrical engineers. It was not the policy of the Association to decry or belittle electricity. The gas industry fully recognized the enormous value of electricity and its potentialities in many directions. It must also be realized that the possibilities of electricity were finite, and were not (as some superficial thinkers and writers would have them believe) boundless and destined presently to provide the universal medium of light, power, and heat. He concluded by saying that the substitution of gas and coke for crude coal in our homes, to say nothing of a similar substitution in our industries, would treble the output of the gas industry, and greatly reduce the cost of gas all over the country. He wished the public to know that gas was the fuel of the future. Gas had it all the way.

Mr. Thomas Hardie (Newcastle) said he believed there was still larger scope for the British Commercial Gas Association. Now that people were settling down on a peace basis, they could look forward to an increase in business. In the war years it had been found that there were new uses to which gas could be put. The munition works in many cases had employed gas; and now that these works would not be used for the same purpose, manufacturers had realized the great uses to which gas could be put. The gas-furnace had shown great economies, had gained a saving in labour, and had got work done with more exactness. From the engineering side of the industry, he might say that, whatever the commercial side could get in the way of business, they could rely that the engineering side would produce the gas necessary.

Mr. Norman S. Cox (Sunderland) spoke of the great services which the Association had rendered to the Sunderland Gas Company. They had often appealed to the Association when in difficulty; and their inquiries had always been attended to and treated with every consideration. He could say that they, as a Company, had got their money's worth by being subscribers to the Association. A good service to the consumer, continued Mr. Cox, was a matter of the greatest importance; and this had been fully realized by the Sunderland Gas Company. The Directors supported a good service to the consumer in every possible way. The best advertisement was a satisfied consumer.

In reply to a question as to what progress had been made in experiments in gas for traction purposes,

Mr. Goodenough said the Gas Traction Committee held their final meeting on the previous day (Thursday) to consider their report; and they would report strongly in favour of the use of compressed gas in cylinders, as a useful competitor with other means of traction. The gas-bag was only a temporary expedient; and not likely to be continued long after other motor fuel became available at a reasonable price. The London General Omnibus Company were about to set on the road twenty buses fitted for propulsion by gas contained in cylinders under the passengers' seats; and from the tests which had been made, they were expecting to get great results. Until this experimental lot of buses had been running for a time he did not think other people would follow suit, because everybody was waiting to see what was the experience of the biggest omnibus company in the country.

Sales Organization.

Mr. F. H. Holland next outlined a scheme for "Sales Organization." This was mainly on the lines of the paper he read the previous Monday at Reading—see *ante*, pp. 307-10.

Mr. Goodenough said it was desired to make it quite clear that the crux of the scheme was, first of all, to ascertain the possibilities of business in their several districts. They all knew what the average consumption of gas per consumer was; how many consumers they had; and most of them knew exactly what appliances their consumers had. But what they did not know was what appliances their consumers had not got, and what the possibilities were throughout a district. When they were carrying out a publicity campaign, they were firing at an enemy without having first located him exactly—to use a simile from the war now happily over. What they wanted to do in the scheme was to locate places in which appliances could be put. It was no use sending circulars to people who had got gas-stoves, or to houses where the consumption of gas was as great as it could possibly be. They must get to know where the opportunities were, and expend their energies on the most likely places. They needed a scientific census of the districts, and of their possibilities. A census in 4000 industries had shown that there were some 372 ways of using gas. In every industrial district it was necessary to know to what processes gas could be applied, and trades could then be approached and helpful information given. It was all a question of getting a scientific analysis of the facts of a district, and then of directing the publicity work and canvassing exactly to the possibilities that existed.

Mr. T. P. Ridley (Newcastle) approved a scheme of the kind outlined, and said it meant getting away from the haphazard to the scientific. The Newcastle Gas Company had taken a first step in making a census of their district.

Mr. H. Chamberlain (Workington) said they also had made a census on the lines indicated.

Mr. F. P. Tarratt (Darlington) regarded the scheme as the keystone of an arch in process of being built, and which promised well. They had a census taken, and it had proved very valuable.

Mr. Goodenough remarked that the Executive of the Association did not wish to convey the idea that the scheme was quite new. They were aware that numerous of the undertakings had already carried out inquiries on the lines of a census, and what the Association wanted to do was to help the districts as far as possible.

Mr. Norman Cox said when they took a census in the Sunderland area they found, in addition to gathering much valuable information, that there were in use some very antiquated gas-fires, which they were able to replace by modern ones.

Mr. Herbert Lees (Hexham) asked what the cost of the scheme was likely to be to small undertakings.

Mr. Goodenough said the terms had not yet been decided; but it was proposed that the service should be self-supporting by the undertakings availing themselves of it. He did not think it would amount to anything serious. The subscribing undertakings would have the services of a first-class man to advise them on the starting of the scheme. It would need experience to tell them what the cost would be; but he did not think it would be at all a serious matter.

At the close of the discussion tea was provided by the Directors of the Sunderland Gas Company.

The after proceedings were open to the public—there being a large audience to hear a paper by Mr. A. B. Roxburgh, of Newcastle, on "Increasing the Utilities of Gas in the Home and Factory."—See below.

INCREASING THE UTILITY OF GAS IN THE HOME AND THE FACTORY.

By A. B. Roxburgh, of Newcastle-on-Tyne.

[A Paper read at the Northern District Conference of the British Commercial Gas Association, at Sunderland, May 2.]

The title of my paper is naturally suggested by the position that it is my honour to occupy with the gas undertaking in the neighbouring city; but before I proceed to deal with the subject directly under review, I propose to offer a few preparatory remarks, to make sure that what we desire to do is the correct and proper action in the National interests as well as our own. It would not be difficult to name some occupations in which it would require quite a stretch of the imagination to think of any

benefit they confer upon the community; but on this account we engaged in the gas industry can have a very easy conscience—nay, a very pleasant one, engendered by the knowledge that we are working towards a desirable end.

The only source of wealth, *plus* natural resources, is labour—not manual labour only; that of the administrator, inventor, professional, and clerical being just as necessary. And I think this chief item may be divided under three heads.

1.—Product of the soil—agriculture and horticulture.
2.—The winning of—and, having won, the economical use of—our natural resources.
3.—General manufactured goods.

So, just for one moment, I want to examine and demonstrate that, by increasing the utility of gas in the home, factory, or workshop, we are on the right lines, not only from the point of view of our own welfare, but from the point of view of the best interests of our native land.

It has been a habit of mine for quite a few years past to try and think of affairs generally in the light of political economy; and I can say, without any fear of exaggerating, that there has never been a time in our history when it was more necessary to develop and encourage this habit than now. In pre-war days, we had so much wealth invested abroad that, without troubling much about developing and conserving our own resources, we were all right. But with the liquidating of the indebtedness of foreign nations to us, it has become of paramount importance to make the most of every resource at our disposal.

From the very exhaustive paper of Prof. Cobb, contributed to the "Edinburgh Review," and the lecture of Sir Dugald Clerk, before the Royal Society of Arts, it is made abundantly clear that the carbonization of coal in a modern gas-works is essentially an economic process—that of the total available heat in the coal, 80 p.ct. is made available in the form desired, and that upon the products resulting from the treatment of coal in a retort depends a whole train of industries, while the productivity of our soil is greatly increased.

The question of the desirability of treating coal in a gas-works is well established; so that I think every man in the gas industry can comfort himself by the sure knowledge that, by increasing the scope of usefulness for gas, he is not only advancing his own individual business interests, but serving at the same time the best interests of his country.

I am an enthusiast in the belief that, in the intelligent and economical use—and no use could be intelligent that is not economical—of gas, lies the solution of many of our domestic and manufacturing problems. I think I can claim to speak with some authority on this matter, because for the past six years I have lived in a house that is under—shall I say—all gas-works conditions. The exact particulars are as follows.

An All-Gas Interior.

My wife and I were looking for another house, and found one that suited our requirements. Fortunately, the only fireplace fitted was the one in the kitchen; so it left us with a fairly free hand without waste of capital. It always seems a pity for a builder to finish off a house with coal grates, and the purchaser or the incoming tenant to start covering them up with gas-fires. It is almost like putting a patch on a new suit of clothes.

Considering the well-deserved popularity of, and necessity for, the modern ventilating gas-fire, with its high radiant efficiency, I think that at least one of the makers of first-class fires should endeavour to meet a demand which will undoubtedly arise for gas-fires at a moderate price that are suitable for building into fire-places, and with a selection of artistic designs similar to those at present on sale for coal-fires.

When on this particular subject, let me say that I most profoundly hope that, in the many building schemes that are foreshadowed to remedy the existing shortage of houses, those responsible for design will not be led away by remarks made by some self-appointed advisers to dispense with chimneys from any apartment used for living or sleeping purposes. Such a proposition would be a distinctly retrograde step, since fresh air is literally the breath of life; and the chimney, owing to its position, is the natural means of securing this. In one large block of offices in Newcastle where there are no separate fireplaces, I always pity the occupants whenever I go into one of them, on account of the stuffy, oppressive atmosphere.

But to return to the subject of my own house. The coal-range for the kitchen has not been used for cooking, except on one occasion (to satisfy the curiosity of my wife to see if the oven would cook, and we had to borrow a bucket of coals from our neighbours); and as soon as, if ever, the price of building materials gets cheaper, it is going to be taken out to increase the size of the room, and to ensure the greater comfort of its occupants. The cooking is, of course, done exclusively on a gas-cooker placed in the scullery, which is fortunately a large one. A more correct title for the scullery would be cookhouse.

Outside is a coke-fired boiler, which provides a supply of hot water in the winter, and keeps a large radiator hot in the entrance hall, a towel-rail in the bathroom, and a row of pipes in the conservatory. In the summer time, when no heat is necessary for the radiators or conservatory pipes, a gas-heated boiler in the scullery, interconnected to the same pipes, provides the bath water required. Its utility and success are demonstrated by the fact that one evening, after a day in the country with visitors, ten hot baths were had, commencing with the children and finishing off with myself.

As gas men, we have got to realize for ourselves, and educate our customers, that the gas-heated water supply is the necessary and logical adjunct of the gas-cooker; and gas salesmen have got to study the best methods of adaptation, in order that the best possible advice may be available.

In the scullery is also a gas-heated set pot, or washing copper as they are sometimes called, in addition to a gas-heated washing machine. The latter is a decided success when the "char lady" can be persuaded to use it. But I am afraid prejudice is against it; and, sad to confess, it is beyond my powers to persuade her that, by turning a handle which any child could operate, she is doing better work than by exerting all her strength with a "dolly" or "poss stick" at the tub. Its secret lies in the fact that, by means of gas, the water can be kept at boiling point while the actual washing is in operation.

Now in our house, there is one thing lacking on that all-important day—the washing day—particularly if the day is a wet one; and that is reasonable facility for drying and airing the clothes. This deficiency has to be remedied. It can easily be done by the provision of a gas-heated airing closet. In a model house at present being erected in Northumberland Road, Newcastle, and which I hope will shortly be open for exhibition, at my suggestion a small apartment is being provided in the scullery, large enough to hold the wringer, but which, when the wringer is withdrawn on washing day, can, by using the bunsen burner at the back, protected by a let-down metal flap, and fixing the tubes on sockets provided, be used as a very efficient drying and airing closet.

A house fitted with the various devices mentioned does, I can assure you, avoid the necessity for 60 p.ct. of woman's drudgery; and in a moderate sized house, with help on cleaning and washing days, but without a maid, the mistress will find that she has quite reasonable leisure.

Before I leave the subject of the home, what about the two "C's"—Cost and Comfort? Both are quite all right. I have gone to the trouble of comparing my costs with those of some others of my neighbours in similar-sized houses with less households than our own, and there is little difference; while I consider our comfort is considerably greater.

I am not prepared to say that on a miserably cold night, with the snow falling and the temperature outside well below freezing point, that there is anything quite so cosy as a really good, well-built coal-fire; but I am sure that the general level of comfort with gas-fires is higher. For instance, during the past winter I had occasion to stay with friends during some cold weather, and every evening I went to bed with cold feet, because it was not worth while making the fire up. The first evening I was back at home, at about 10.30, when going to bed, I made the remark to my wife "that there was some good in gas-fires, as the first time for a few nights I was going to bed with warm feet."

It is, of course, generally admitted, that, for occasional use, nothing is as good as a gas-fire. But my object in giving you my own personal experience is to demonstrate that, from an everyday, practical standpoint, gaseous fuel is the better. You will realize from what I have said that, in my case, the doctor has not been afraid to take his own medicine and pronounce it good.

I have already dealt somewhat lengthily with the domestic side of the question; but before I leave it, I should like to draw attention to the necessity of fitting adequate sized piping in all portions of the installations of new houses. Many of the old houses are sadly lacking in this respect, and no service of gas in the home, or anywhere else as a matter of fact, can be quite satisfactory unless the supply is adequate, when and where it is wanted; and only proper sized piping and pressures will secure this.

Gas in Industry.

The war can truly be said to have enabled gas to come into its own in the factory. The shortage of labour, and the necessity for securing greater and quicker output, compelled manufacturers to use that fuel which could be obtained by the turning on of a tap, was always at command, was capable of reaching high temperatures quickly, and was then subject to uniformity or infinite variation at will. For me to attempt to cover the whole field of industrial uses for gas would be manifestly an impossibility, because no one man gets the necessary experience. But as I wish this paper to be as personal as possible, I will mention a few cases of very successful operations that have come under my own purview.

A firm of manufacturers of aeroplanes and aeroplane parts was in need of considerable quantities of die stampings, and attempted to make them by using ordinary smith's fires for heating, with the result that they cost more even than they could be purchased for already completed. Some gas-forges were then installed, with the result that the costs of production were reduced to such a figure that it paid the firm particularly well to manufacture the articles themselves, with the added advantage of the certainty of obtaining just what they wanted and when they wanted them.

In the instances under review, the cost of fuel in either case was hardly an item to be considered. The costs of importance were wages and standing charges. With wages at the present level, if half a man's time can be saved on any particular pro-

cess, the actual wages represented by the time saved, together with the standing charges, will pay for a good deal of gas, not to mention the other advantages that rapidity of production ensure. I should like to point out that many of the forgings dealt with are by no means small. Blocks of steel up to 6 in. and 9 in. cube are often heated. These, of course, take some time to soak through; but for the small pieces, up to (say) 2-in. section, only a very short time is required. One particular advantage of a gas-heated furnace is that in nearly all operations the articles under treatment are visible; so that, with an operator who exercises reasonable intelligence, there is much less liability to error than with forges where the articles are buried in solid fuel. This is an advantage I have experienced, but not seen advertised.

These remarks remind me of another factory where, after many attempts, I persuaded the management to adopt, with great success, gas-heating for the tool-room. The tools dealt with in a tool-room form the deciding factor in the output from the machines. Any machine-tool—say, lathe, planing machine, shaper, drill, miller, or what you will—is valueless until the cutting tool is added to it. Granted work for the machines, the output depends on the time they can be kept at work. So that in these days, when so much is heard about quantity production, the importance of seeing that the actual cutting tool is scientifically treated is manifest. The value of the machine itself (they are generally known as machine-tools; but I will omit the word "tool," so as not to complicate words) may run into hundreds of pounds; the actual cutting-tool only being worth perhaps a few shillings. Yet if this article of small value is not right, the valuable machine, together with the time of the operator, is rendered valueless. This advantage obtained from the scientific treatment of steel in gas-furnaces is altogether out of proportion to the small capital cost of the installation or the additional cost, if any, of wages and fuel in working it.

Preparing these remarks reminded me that I would like the previous expressions of favourable opinions confirmed from the firm in question; and I find that time only strengthens their opinion as to the absolute necessity for what before installation they considered a questionable luxury. One reason why I have drawn attention to this installation is that it epitomizes very correctly the advantages that are to be obtained from the use of gaseous fuel for industrial purposes.

The cost of fuel is usually one of the smallest items; it is the results obtained that matter. In conversation with a customer the other day, he was drawing attention to the cost of some nickel-chrome steel he was using for making gears, and for which he stated he had paid 2s. 10d. per lb. By the time the steel had been shaped into the form required, the cost of the labour and standing charges added to the cost of the material, the total cost would be quite a substantial one; and yet the whole might be rendered useless by breakage at the first time of using by incorrect heat treatment.

In speaking of the uses of gas in the factory, the hearer naturally thinks of the particular trade he may be interested in; while the advocate needs to think of every trade. If a man is specially interested in an engineering works, for example, he thinks—rightly, too—in terms of engineering; while a baker would, of course, think in bakers' terms. It is, therefore, most necessary for the man responsible for advocating the uses of gas to learn as fully as possible processes, terms, and details applying to the trades practised in his district. By this means he is entitled to talk to the customer on his own doorstep, and get into his mind much quicker.

To illustrate this, we have recently built a brick bakers'-oven heated by means of gas—size of the working space of the oven 7 ft. 9 in. by 3 ft. by 12 in.—which has proved very satisfactory The member of our staff whose duty it has been to push the use of similar ovens has met with very considerable success—partly, I think, because he has taken some trouble to talk to the bakers in their own terms. The floor of the oven is called the "sole"; the particular appearance imparted to the goods baked is called the "bloom"; and the filling and emptying the oven is called "peeling." The other day a prospective purchaser thought this particular representative had been associated with the baking trade. It is manifestly impossible for a gas undertaking to employ specialists for every trade; but to gain the confidence that leads to business, it is very necessary for the gas representative to be able to intelligently converse with his prospective customer. He must, however, be very careful to remember that a little knowledge is a dangerous thing. The very fact that he has learned something about a trade or industry is proof that he will all the better be able to suggest new uses for gas in connection with it; and as soon as he has learned sufficient, he will find that there are few trades in which gas cannot become of vital use.

I remember one case I had some time since, where gaseous fuel had been adopted in lieu of solid with very marked success. The proprietor desired to see me on some other business. But before calling to see him, something suggested that I should arm myself with one or two facts. After the particular business necessitating the call had been disposed of, I casually asked how the plant previously referred to was going on; so he tried to "pull my leg" by saying "Very well, but very costly." I parried by asking him how much it was costing. He did not know; but I did—I had looked it up. So I told him £75 a year; and did he think it was dear? His reply was very eloquent and pleasing. He said: "Well, it does not matter what it costs, after our experience with it, the advantages are such that we should have to continue." I knew more than this. I knew that his cast-iron pans never lasted him more than six months when using coal, that the expense of pulling down and rebuilding the brickwork was considerable, and that since using gas he had not had a new pan at all. I also knew that the labour had been very materially reduced, and, further (and perhaps most important), as it was a job necessitating fairly accurate temperatures, the quality of their product was improved. The customers knew these added facts also; so in the further conversation that followed we turned ourselves into a mutual admiration society.

The title of this paper is so wide that I feel at liberty to skip from one thing to another; and I hope you will bear with me. I do not desire to make it merely a repetition of the uses of gas, as that can be obtained from the literature of the "B.C.G.A.," and from makers' catalogues, but to stimulate and encourage all concerned to the knowledge that gas is a real factor in the development of our lives and industry, and that to the enthusiastic propagandist, duty when fulfilled results in many pleasures engendered by the knowledge of achievement.

The Value of the Show-Room.

The show-rooms in the gas industry will play an increasingly important part; and much consideration is necessary in order to properly stock them. It has been my experience that the placing on show of saleable articles is always the prelude to their sale. Their presence suggests their use to the caller, who may be there on other business entirely. There was a case in point within the last month. I daresay you nearly all remember the yarn about the old sea captain who, on a long voyage, occupied his spare time making a very elaborate dog kennel in his cabin, only to find out at the end of the voyage that it would not go through the doorway. We took an order to fix a clothes dryer and airer for a hairdresser, only to find on delivery that it would not go down some stairs to the desired position, and another one had to be made in halves. The airer and dryer that was to spare was accordingly placed in the show-room; and within a week it was sold to another customer. I venture to say that if it had not been on exhibition it would never have been inquired for.

I qualify my remarks by saying "saleable" goods; and a good deal of the knowledge which experience alone can give is necessary to ensure that they are saleable. To illustrate this, some little time after the outbreak of hostilities there was a considerable demand with us for vessels in which to boil water for what appeared to be temporary purposes. For a long time we had in stock—it seemed without hope of selling—some strong tin vessels that could be used for the purpose if put over a suitable bunsen burner. But still they did not sell. So I got a base made, including a suitable burner, and put it on show as a complete item. It was a 30 gallon size; but it sold the next day. Since then we have supplied literally hundreds of such apparatus, varying in size from 3 gallons to 50 gallons each.

I consider that every gas show-room in an industrial area should have available for inspection, and, of course, sale, one or more of every kind and type of bunsen burner that is at all likely to be required, as it must be remembered that one such large burner is equal, from a consumption point of view, to perhaps a short street of small houses. Only a few days ago we had bought rather largely of this type of burner, and even I wondered if I had not overdone it, and they would remain in stock too long. A gentleman came in and purchased, for immediate use, five of the largest, capable of using about 150 c.ft. of gas each per hour. Often a customer puts off ordering till the last minute; but if the articles are in stock, the sooner they can be fitted the sooner they use gas.

One wet morning recently I was walking with a friend to the train; and on finding a difficulty in lighting his pipe with his umbrella up, he closed it. This action brought forth a question from me, "Would he rather get wet or do without a smoke?" The answer came at once: "Get wet, one can always get dry; but a smoke once missed can never be replaced." Gas consumption is very much like the smoke—delays in getting apparatus to work mean loss of consumption that can never be regained.

Qualification for Good Salesmen.

I have dealt at considerable length with the show-room end of our business; but there is another important item, and that is representatives—the gas industry's ambassadors. With the newer phase of the industry, in many cases these have to be trained from the most fitting members of the ordinary office staff. There are two classes of commercial travellers—the one class simply carries round its samples, exhibits them to prospective purchasers, and takes such orders as can be induced; the other class is where the representative rarely carries a sample, but fulfils his mission by his ability to give technical information and advice. The former class simply saves the buyer's time going somewhere to inspect samples, and could be managed without; the latter is a strict necessity. This latter is the only class of any value in the gas industry as between the gas producer and the user.

The representatives, to be of any real value, must be men of sound general knowledge. Those more particularly dealing with householders, institutions, &c., must be expert in domestic econ-

omy; those dealing with shopkeepers must have a sound knowledge of heating, lighting, and display; while those dealing with industries must have a comprehensive knowledge of general engineering. The latter class should have a working knowledge of simple formulæ, so as to be able to transpose terms of gas to terms of heat or power, have a general knowledge of working temperature and trade processes, and generally be able to intelligently discuss with a prospective user any process in which gas can be applied. Further, all classes must take a living interest in their business, and make it their hobby. The show-room should be their training ground, and frequent meetings of the two staffs, indoor and outdoor, should be held.

STAFF ADDRESSES.

We have resumed, after the break caused by the war, our fortnightly meetings of the whole staff of the sales of gas department. These meetings occur after the usual office hours, the company providing a tea. The office closes at 5 p.m., and it is usual to have finished tea by 5.30, when an address is given, usually lasting 45 to 50 minutes, followed by a discussion. The addresses are of two kinds—technical with practical demonstrations, and the principles of commerce; the former to increase the practical knowledge of the staff, and the latter the commercial. From all appearances these meetings are much appreciated, and certainly engender a feeling of unity and goodwill among the various sections of the staff. The one axiom they are asked to remember is that no staff is all it should be unless all feel one way and every one is an expert at his or her job.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Fuel Research Board's Report on Gas Standards.

SIR,—I venture to bring to your notice the following suggestion: Seeing there is such wide divergence of opinion in regard to what is, and what is not, the best quality of gas to supply, let the gas-works throughout the country, or a specified number that apply to the Board of Trade or the Local Government Board, be allowed for six months, or the necessary period, freedom from all restrictions as to quality, inerts, or any other matters in connection with town's supply, so that large-scale experiments can be made—provided always that they satisfy their customers' needs, and charge proportionally for the B.Th.U. supplied.

I believe that the greatest good would be the outcome of the experience and information thus obtained; and I trust this idea will warrant your advocating it. GEO. HELPS.

Nuneaton, May 3, 1919.

Cooking by Gas and Electricity.

SIR,—In an American Gas Association abstract of an article by H. H. Creasey which appeared in the "JOURNAL" for June 11, 1918, p. 499, it is stated that actual tests show that, in practical cooking, as much useful work is obtained from a thermal unit derived from the combustion of gas as from a thermal unit derived from the conversion of electric energy into heat. In some modification of this, the author concludes that, to secure a certain amount of heat for cooking, six times as much coal would have to be destroyed in producing the electric energy as the gas used for the same purpose.

Our experience is a little at variance with this. For example, careful tests have shown us that, with gas at $1.00 per 1000 c.ft., and electric energy at 3 c. per KW-hour, a typical customer's gas bill for cooking runs to $2.35 a month for gas, against $3.74 for electricity—corresponding to 2350 c.ft. of gas and 125 KW-hours. The amount of fuel destroyed in producing 2350 c.ft. of coal gas is approximately 235 lbs. of coal; while using 3 lbs. of coal per KW-hour delivered to a consumer, the corresponding amount of coal used in generating electricity was 375 lbs.—a ratio of 1·6 to 1, instead of 6 to 1, as suggested in the article.

The 2350 c.ft. of gas is equivalent to 1,292,500 B.Th.U.; while the 125 KW-hours is equivalent to 425,000 B.Th.U.

These figures are, of course, based on practical experience, and not on a theoretical computation. It, therefore, looks to us as if it was up to the gas-appliance manufacturer to produce a more efficient gas-range.

We would be glad to have your further comments on this proposition.

VICTOR STARZENSKI, Assistant General Manager,
Schenectady Illuminating Company.

Schenectady, N.Y., April 5, 1919.

[The foregoing letter by Mr. Starzenski is interesting. Mr. Creasey is, of course, responsible for his own figures. Nevertheless, some comments may be made upon the letter. The first thing that strikes us is the fact that 235 lbs. of coal only are used to produce 2350 c.ft. of gas, which is equivalent to 10 c.ft. per lb.; and 2240 lbs. × 10 c.ft. =22,400 c.ft. per ton! The 2350 c.ft. of gas being equivalent to 1,292,500 B.Th.U. (or 550 B.Th.U. per c.ft.), it would require, at 3 lbs. per KW, 1134 lbs. of coal to put at the disposal of the consumer an equal quantity of heat energy by electrical means, all of which coal would be destroyed; whereas, in the making of gas, there are the coke, tar, ammonia, &c., all to the good. If it only requires 425,000 B.Th.U. electrically produced to do the same work as 1,292,500 B.Th.U. produced by the combustion of gas, then it shows that the American gas apparatus must be deplorably bad in efficiency. But is "the same amount of work" done? Our experience on this side is that no comparison of costs in so-called "typical" houses is ever satisfactory. We could take half-a-dozen similar houses that could be called typical (though how one would select a typical house is not apparent without an elaborate definition of the type desired), all using gas for cooking, and yet find as many (and widely) different annual consumptions, and therefore costs. No one can ever safely answer the question, What does it cost to cook by gas? or coal? or electricity? without stating a large number of factors governing his estimate, and then allowing a wide margin. The only trustworthy comparison is one based on cooking exactly similar quantities of exactly similar foods by the various methods. Tests recently carried out by the British Commercial Gas Association, before an independent umpire, showing that, in cooking meat in the oven—the process most favourable to electricity—10 c.ft. of gas of 480 B.Th.U. would do the work of the unit of electricity; and as in hot-plate work (of which more is done than oven work) the comparison is still more favourable to gas, there is certainly little, if any, exaggeration in stating that "one B.Th.U. is as good as another" whether gaseous or electric in its conveyance. The electricians have never seemed keen on a test comprising all methods of cooking; and they appear to be shy now even of the oven tests.—ED. G.J.]

REGISTER OF PATENTS.

Production of Oils from Coal Tars and the Like, also Carbon and Pitch free from Uncombined Carbon.—No. 17,140 of 1915.

MAJOR, J. L., of Sculcoates, Kingston-upon-Hull.

No. 17,140; Dec. 6, 1915.

According to this invention, the matter to be treated (say, coal tar) is agitated with a solvent—such as petroleum, or a volatile fraction of petroleum, or shale oils, or naphtha, or oils obtained from coal tar—employed in quantity in accordance with the nature of the tar under treatment, and also in accordance with whether oils and soft pitch (that is, pitch containing uncombined carbon) only are required, or whether, in addition to the oils, both carbon and pitch relatively free from uncombined carbon (that is, asphaltum) are required; the amount of solvent employed being greater in the latter than in the former case.

After the mass has been agitated for a sufficient time, it is allowed to stand; and (if the solvent has been used in quantity insufficient to cause uncombined carbon to become separated from the pitch) soft pitch will settle-out, and the required oils will be in solution in the supernatant liquor. This liquor can be used for any required purpose, or it can be subjected to such fractional distillation and refining as may be necessary to obtain separately the constituents of the liquor. The soft pitch can be further treated by distillation for obtaining the carbon and pitch, or asphaltum, in the required condition.

Where a larger amount of solvent is used to obtain the pitch free from uncombined carbon and the carbon separately, the uncombined carbon will separate out, and the supernatant liquor and asphaltum can be removed for treatment for any desired purpose. When it is distilled, the portion which does not distil off is comparatively free from uncombined carbon, and is therefore asphaltum. The carbon which has separated out can be subjected to suitable treatment, and is "in a valuable form for various purposes for which such carbon is required."

When treating crude tar, it is found sufficient to mix it with about twice its volume of the solvent, and when treating coal-tar pitch, it is sufficient to mix it with about four times its volume of solvent. In either case the mass is agitated for about an hour in a cold or warmed state, when the tar or pitch is dissolved, and afterwards the uncombined carbon will settle on standing. The supernatant liquor can be decanted off and distilled in any suitable way. The more or less settled uncombined carbon (which is in a very finely-divided state) can then be filtered in order to separate any liquid, which consists principally of readily volatilizable oils.

Igniting and Extinguishing Gas-Burners. No. 124,346.

RADET, L., of Paris.

No. 10,762; June 29, 1918.

This invention relates to apparatus for automatically igniting and extinguishing gas-lamps at predetermined times under the control of a timing device of the kind in which a supply mechanism first ignites a pilot jet and subsequently supplies gas to the main burner so that the latter is lighted without explosion. In combination with it is an ignition device in which an eccentric rotating upon the main axle of the apparatus has a projecting dog on the collar passing through a spring drum on the axle and adjusted to strike against projections inside a fixed ring on the body of the apparatus. The rotation of the main axle first winds-up the spring of the drum; and then, by the withdrawal of the dog, it releases the coiled spring, and causes the drum to impinge rapidly upon a ferro-cerium rod, "thereby producing a shower of sparks at each impact." The means for supplying the gas consists of a distributor rotating against the smooth face of the apparatus provided with channels and exit holes for supplying gas to the pilot jet and the main burner respectively; the distributor having a

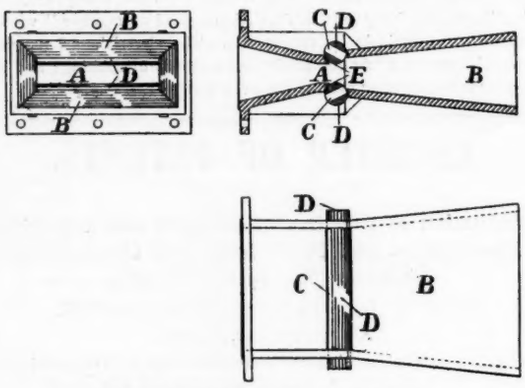
curved slot admitting gas to reach first the inlet of the pilot jet, and, secondly, the inlet to the main burner for the period of ignition desired. But during the period of the lighting, it effects the closure of the pilot jet inlet, while the inlet of the main burner remains open. Finally, when the extinction of the light is desired, the inlet to the main burner can be closed automatically.

Air-Admission Valves for Atmospheric Gas-Burners.—No. 124,362.

Hunter, T. M., of Glasgow.

No. 11,990; July 23, 1918.

An air-admission valve according to this invention consists essentially of a cylindrical, or partly cylindrical, piece having slots through it, longitudinally, in such a manner that the air is admitted through them into the mixing-tube of the burner; and, by rotating the valve upon an axis, the area by which air enters may be increased or reduced as required. The valve is so placed at the end of the mixing-tube which is next the gas inlet that part of the cylindrical surface of the valve acts as a guide to the outcoming gas stream.



Hunter's Atmospheric Gas-Burner Valve.

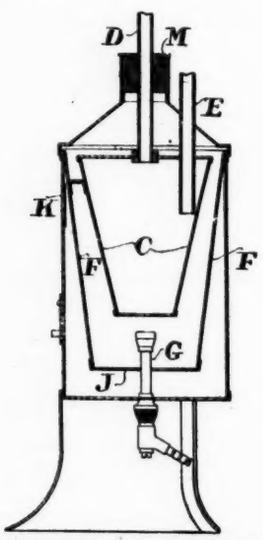
A front view, a longitudinal section, and a view in plan of the burner are given. The gas is delivered from a nozzle A into a mixing-tube B, rectangular in cross section, and of gradually increasing area from the throat or nozzle outwards. Air is admitted, by passages C, through the air-inlet pieces D. By rotating these pieces, which are carried in circular holes formed in the body of the burner, the area by which air enters is increased or reduced, as less or more of the width of the passages through the air-inlet pieces is covered by the body of the burner. The air-inlet pieces are so placed that they act as guides to the outcoming gas stream, as shown at E.

Hot-Water Circulators.—No. 124,674.

Fletcher, Russell, and Co., Ltd., and Banks, W., of Warrington.

No. 15,741; Sept. 27, 1918.

This invention relates to hot-water circulators especially applicable for maintaining in garages a circulation through the radiators and jackets of the cylinders of the engines of motor vehicles during frosty weather.



Banks' (Fletcher, Russell, & Co.'s) Hot-Water Circulator.

In an outer casing provided with supporting legs is an inner water vessel C, provided with flow-and-return pipes D E. F is an inverted frustro-conical baffle or casing surrounding the vessel C; and G is a bunsen burner extending into the casing F to heat the water vessel, which is provided at its lower end with a perforated or fine wire gauze bottom J. Near the top are inlets K for the admission of air to the burner, and an outlet M, through which the flow pipe D passes, for the escape of the products of combustion from the burner—both fitted with fine wire gauze. Lighting apertures are provided in the outer casing below the air inlets K and in the baffle or intermediate casing F. The air inlet at the entrance to the mixture tube of the burner is fitted with a shield of fine wire gauze. The gauzes prevent any flame in the circulator passing to the outside of the outer casing, and the gauze shield referred to isolates from the outside flame at the nipple of the burner in the event of the latter lighting back. There is thereby no danger of fire, even if used in proximity to the most inflammable of substances and in explosive atmospheres.

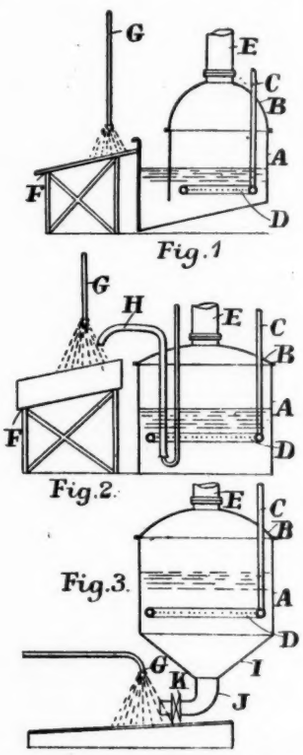
Manufacture of Sulphate of Ammonia.—No. 124,946.

Sheard, J. T., of Birley Carr, near Sheffield.

No. 7972; May 13, 1918.

The *rationale* of this invention was dealt with in last week's Journal, p. 245. It may be remembered that the object of the inventor is to provide simple means for dealing with sulphate discharged from a saturator in an acid state, and at the same time (as far as possible) to avoid washing the sulphate.

The invention consists in spraying clean water over the magma of crystals of sulphate in their enveloping acid liquor just as removed or ejected from the saturator; the spraying being effected immediately the removal takes place and before draining, for the purpose of diluting the mother liquor and so enabling it readily to drain away from the crystals on an ordinary draining table without having recourse to washing the crystals and thereby losing sulphate. In carrying out the invention, therefore, the patentee arranges that the magma of crystals of sulphate in their enveloping mother liquor, as it flows or is ejected from the saturator, is played upon by a shower of intimately divided or atomized jets of water. In its simplest form the arrangement consists of a tube conveying water under pressure, having a flexible or swivelled end-piece terminating in a rose or other form of jet which will deliver the water in a shower of fine spray, and which is directed on the magma of crystals of sulphate enveloped in mother liquor issuing from the saturator. There is said to be no loss by this process, as whatever is dissolved-out of the sulphate by the washing drains away with the mother liquor to the well for further use.



Sheard's Sulphate of Ammonia Plant.

Three simple forms of ordinary apparatus are shown. Fig. 1 is an open saturator arranged to allow for hand-fishing of the crystals. Fig. 2 is a closed saturator with steam ejector. Fig. 3 a closed saturator with bottom discharge. In fig. 1 the open saturator tank A is combined with the bell B, into which ammonia is passed by the pipe C and discharging ring D—waste gases leaving by the exit E. Affixed to the side of the saturator is an ordinary draining table F, above which is a water jet G. The crystals of sulphate are removed by hand-fishing with a scoop, which is dipped into the saturator, and brings up a mass of crystals with enveloping mother liquor, which is deposited on the draining table. In this case, the water spray is played over the mass as it is deposited on the table. In fig. 2 a steam-ejector H ejects the sulphate from the lowest part of the interior of the saturator. When steam is turned on, a stream of mixed crystals and mother liquor is discharged from the ejector on to the draining table. In this case the jet delivering the water spray is fixed near to (and immediately above) the outlet of the ejector; so that the

stream of mixed crystals and mother liquor, while flowing from the saturator, is enveloped in water spray or mist. In fig. 3, the lower part of the saturator is made in the form of an inverted cone I with a bend piece J and valve K fixed at the apex. As the crystals of sulphate form and accumulate in the saturator, the valve is periodically opened and a mass of crystals and mother liquor flows out and on to the draining table—meeting, and being enveloped by, the finely-divided water spray coming from the jet G fixed immediately over the discharge orifice.

Thus in all cases, the patentee remarks, he is able to envelop the mass of crystals and accompanying mother liquor in water spray immediately they are removed from the saturator, and before any mother liquor has drained away, because the object is not to wash the crystals but to dilute the accompanying mother liquor, so that the latter can more easily and more completely drain or flow away from the crystals. In other words, he dilutes the mother liquor which surrounds every crystal, and which has considerable affinity for water, and then allows such diluted mother liquor to drain away from the crystals. The water spray is only in operation as the mixed sulphate and mother liquor is being delivered from the saturator. When the supply of sulphate ceases to flow, the water is stopped—that is, he does not continue the spray on the salt from which the mother liquor has drained away, but only the mother liquor which accompanies the crystals as delivered from the saturator.

Gas-Diverting Valve for Purifiers.—No. 125,040.

R. & J. Dempster, Ltd., and Rodger, W. F., of Manchester.

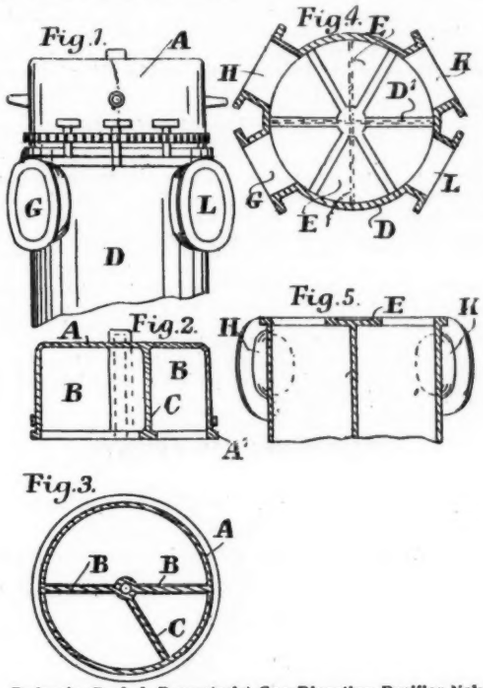
No. 20,423; Dec. 9, 1918.

The object of this invention is to provide a valve similar to the four-way type, but of such "construction that a less number of valves are required for a set of purifiers (when more than two are employed)—for example, four valves for four purifiers, as compared with ordinary practice." With such a valve, it is possible to couple adjacent compartments, and, at the same time, close or blank-off the other compartments, so that the passage for the gas from one to the other is prevented.

Fig. 1 is an elevation of the hood and part of the body portion of a valve of the rotating type, provided internally according to the present invention. Fig. 2 is a sectional view of the hood. Fig. 3 is a cross sectional view of fig. 2. Fig. 4 is a cross sectional view of the body portion of the valve, with a middle part shown in plan only. Fig. 5 is a section through fig. 4.

The hood portion of the valve is provided with a diametrical barrier B and a radial barrier C, which extend down to the part where the hood makes joint with the body of the valve. The area of the sector formed by the barriers is approximately one-sixth of the area of the whole circle within the walls of the hood. D (the body part of the valve) is divided into four parts by walls extending down the valve, but which at the upper part is provided with barriers dividing the circular area into six parts, approximately equal, and of sector formation—that is to say, there are a pair of solid barriers or sectors E between each pair of pipe sockets or openings G H and K L, and two cross barriers. When the barrier B coincides with the barriers of the body D, gas cannot pass over the walls; also when B and C of the sector area in fig. 3 similarly coincide with a sector E there is no way over the sector areas or compartments for the gas.

The patentees, by the aid of a series of diagrams attached to their specification, then proceed to explain the several ways in which the valves may be employed—saying that the exact manner in which the area between the body and the hood of the valve is divided into six equal or approximately equal parts may be varied to some extent, according to the shapes of the barriers adopted, without departing from the nature of the invention.



Rodger's (R. & J. Dempster's) Gas-Diverting Purifier Valve.

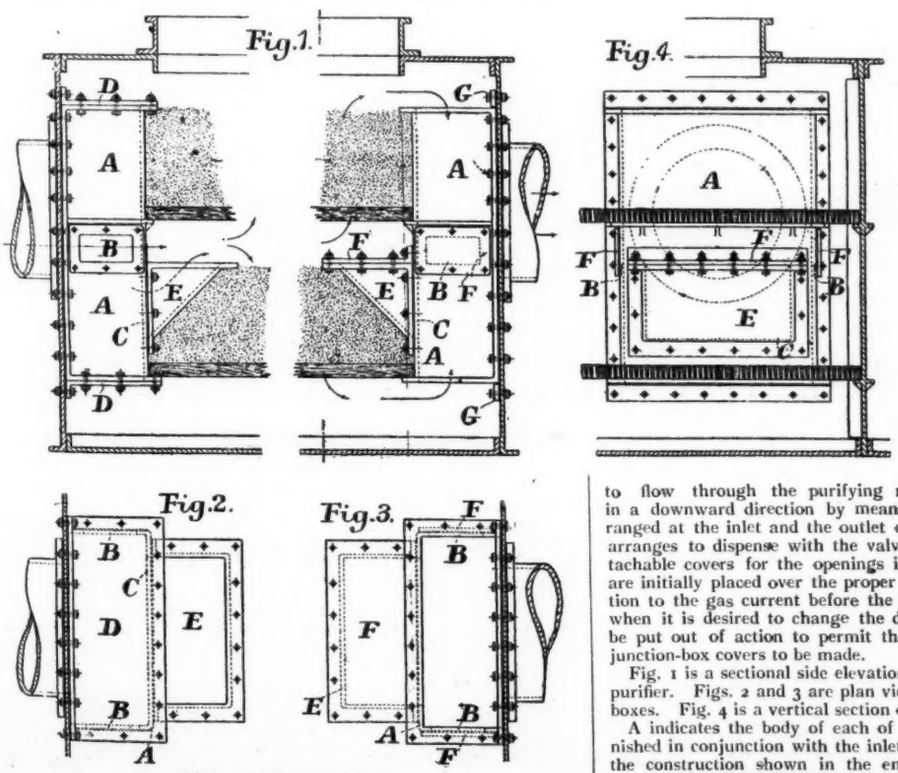
Their claim is: For use with gas-purifiers or like apparatus, a gas-diverting valve of the rotating type, provided in the body part with passages leading to four sockets or openings for the admission and discharge of gas, with an area, through which the gas passes before escape, divided into six equal or approximately equal parts, two of which are blanked, and each of the other pairs divided by a cross barrier; the hood of the valve having provided diametrical and radial barriers extending down its length, whereby a pair of body sockets or openings may be left open when another pair remain closed or blank, for the purpose and in manner set forth.

Gas-Purifiers.—No. 124,994.

Milbourne, R. J., of Lilleshall.

No. 11,453; July 12, 1918.

This invention relates to purifiers wherein the gas is caused to flow through the purifying material either in an upward or in a downward direction by means of reversible junction boxes arranged at the inlet and the outlet ends of the purifier. The inventor arranges to dispense with the valves heretofore used and employ detachable covers for the openings in the junction boxes. The covers are initially placed over the proper openings to give the desired direction to the gas current before the purifier is put into operation; and when it is desired to change the direction of flow, the purifier must be put out of action to permit the necessary re-arrangement of the junction-box covers to be made.



Milbourne's Gas-Purifiers.

Fig. 1 is a sectional side elevation of the inlet and outlet ends of the purifier. Figs. 2 and 3 are plan views of the inlet and outlet junction-boxes. Fig. 4 is a vertical section on the line of fig. 1.

A indicates the body of each of the junction-boxes; one being furnished in conjunction with the inlet and the other with the outlet. In the construction shown in the engraving this junction-box body is rectangular, and furnished with flanges to be bolted to machined

facings on the side plates of the purifier body. The upper and lower ends of each junction-box are open; and each box is furnished with lateral openings B, and an opening C at the front lower part. Covers D are arranged for closing the upper and lower ends of each junction-box—two covers being provided in connection with each set. E is a directing baffle bolted to the outside of each junction-box body in front of the lower opening. F indicates the covers provided for closing the openings in each junction-box. G are flat strips to protect the machined facings on the purifier side plates when the covers are not bolted in position. These strips then take the place of the covers.

As already mentioned, by opening and closing the openings in the inlet and outlet junction-boxes, the flow of the gas through the apparatus may be passed in any direction required. The disposition of the junction-boxes is such that the flow of gas is directed into the central space between the lower and upper tiers of purifying material, whence it is distributed over the whole area of the purifier—half passing upwards and the other half downwards through the purifying material, and finally passing away from the top and bottom of the purifier through the open ends of the outlet junction-box, as indicated by the arrows. By altering the manner in which the openings of the inlet and outlet junction-boxes are covered or uncovered, the gas can be made to pass upwards through the whole of the purifying material, or downwards through it, or in the reverse direction to that shown—*i.e.*, in equal parts from the top and bottom into the central space between the two layers of purifying material, and thence through the outlet junction-box.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for April 30.]

Nos. 9912—10,449.

Bayliss, F. W.—"Containers for storing gas under pressure." No. 10,200.
Combustion Improvements, Ltd.—"Combustion of explosive gaseous mixtures." No. 10,323.
Cruyt, L. C.—"Method of utilizing heat of waste furnace gases, &c." No. 10,356.
Essex, G. J.—"Gas-burner." No. 9959.
Franklin, P. D.—See Essex. No. 9959.
Freer, W.—"Hot-water circulators, water-heaters, &c." No. 10,014.
Gardner, J.—"Gas-stoves, gas-rings, &c." No. 10,091.
Glover, T.—"Air-regulator for atmospheric gas-burners." No. 10,142.
Hauser, E.—"Retort-ovens for distillation of fuels." No. 9970.
Heeley, G.—"Distillation furnaces." No. 10,174.
Oldham, G. T.—See Essex. No. 9959.
Parkes, A. W.—"Incandescent gas-burners." No. 9995.
Rennison, F. T.—"Reversible gas-heated furnaces." No. 10,307.
Richards, R. W.—"Explosive-gas turbine." No. 9983.
Sedcole, W. J.—"Apparatus for distilling carbonaceous material." Nos. 10,447, 10,448
Snell, C. Scott-.—"Burners for inverted mantles." No. 10,126.
Surface Combustion, Inc.—See Combustion. No. 10,323.
Swinburne, J.—"Low-temperature distillation." No. 9987.
Thomas, A. H.—"Gas-stoves." No. 9982.
Tod, D. V.—"Gas-heated boiler." No. 9989.
Wakeling, T.—See Gardner. No. 10,091.
Wylie, H. N.—See Bayliss. No. 10,200.

New Verticals for Walsall.—The Walsall Corporation Gas Committee recommend that the tender of the Woodall-Duckham Company, Ltd., be accepted for the construction at the Pleck Gas-Works of an installation of vertical retorts sufficient to carbonize 100 tons of coal, producing 1¼ million c.ft. of gas, per day, at the price of £39,755.

Brighton Gas Company's Capital.—There is to be a special general meeting next Friday of the Brighton and Hove General Gas Company, at which one of the resolutions to be submitted will authorize the raising of £99,483 of capital, by the creation and issue of redeemable preference stock, and will authorize the borrowing of £32,080, by the issue of redeemable debenture stock. It will also authorize the formation of funds for the redemption of each kind of redeemable stock and the investment and application of moneys to be credited thereto.

Bombay Gas Company.—The accounts for the year ended Dec. 31 will be presented at the meeting on Thursday of next week. The profit for the year as shown by the net revenue account, after allowing for interest and exchange, amounts to £34,117, making, with £18,618 brought forward from the preceding year, £52,735 available for dividend. Deducting the interim dividend paid in November last (£11,200), and placing £1308 to the reserve fund, £5346 to the renewal fund, and £146 to the insurance fund, there remains £34,733, out of which the Directors recommend a dividend of 4 p.ct. (less income-tax), making 8 p.ct. for the year, which will leave £23,533 to be carried forward to the current year.

Hull Corporation and the British Gas Light Company.—Recently the Hull Corporation asked the Town Clerk to report with reference to the powers of the British Gas Light Company in the matter of maximum price and dividends. At the last meeting of the Gas Committee, the Town Clerk reported that, under section 12 of their Act of 1858, the Company were authorized to charge for gas up to 5s. per 1000 c.ft. The present proposal of the Company, therefore, to increase the price to 4s., was within their rights. As regards dividends, these vary with different issues of capital; the maximum ranging from 10 p.ct. on an original capital of £57,624, to 3½ p.ct., which was the lowest maximum on any part of the capital. The last issue authorized by their Act of 1914 bore a maximum dividend of 5½ p.ct. The Committee, having discussed the matter, decided to take no action.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Brentford Gas Bill received the Royal Assent.

The Bournemouth Gas and Water Bill was brought from the Commons, read a first time, and referred to the Examiners.

The Order made appointing a Select Committee to consider the Pembroke Gas Bill, was discharged.

The Hartlepool Gas and Water Bill was reported, with amendments

The South Shields Gas Bill was read the third time, passed, and returned to the Commons.

The Northampton Gas Bill was brought from the Commons, read a first time, and referred to the Examiners.

HOUSE OF COMMONS.

Progress of Bills.

The Sunderland Corporation have presented a petition against the Sunderland Gas Bill.

The Bournemouth Gas and Water Bill and the Northampton Gas Bill were read the third time, and passed.

Reports have been referred to the Select Committee on Standing Orders, which state that, in the cases of the Dover Gas Bill and the Swinton and Mexborough Gas Board Bill, the Standing Orders have not been complied with.

Exemption of Benzol from Taxation.

Mr. Austen Chamberlain, as Chancellor of the Exchequer, in introducing the Budget last Wednesday, said he proposed to give legal authority for the exemption of benzol from taxation by repealing the Excise duty. He remarked that a difficult position had recently arisen in regard to benzol manufactured in this country. Before the war, benzol was one of those spirits which were occasionally and experimentally used for propelling motor-cars, but were not taxed when so used. The war had, however, changed the position completely. During the war the production of benzol was stimulated by the Munitions Department, with remarkable results. There was now in existence a manufacturing industry with large stocks of spirit which the Munitions Department no longer required, and a large continuous output amounting to about 100,000 tons a year, of which 75,000 tons, or thereabouts—equivalent to 20 million gallons—was available for motor fuel. Then the Board of Customs and Excise felt it to be their duty to issue a warning that benzol so applied might be subject to taxation. He had now to consider what was to be done. This was a case of an industry found vital during the war—practically created at Government instigation and under Government guidance; and this industry was suddenly confronted with the loss of its market owing to the cessation of the war. And this was not all. Benzol was not only important to the nation as an additional indigenous source of supply of motor fuel, but it was a very important ingredient in the dyeing industry—an industry which had been found so vital to our existence and to our trade, that the Government had done everything possible to establish it and to promote its growth in this country.

Lewes Gas-Works and Coal Supplies.

Lieut.-Colonel Campion asked the President of the Board of Trade whether he was aware that for the period from May 1, 1918, the Lewes Gas Company had only been able to obtain 804 tons of coal, whereas their contract was for the supply of 1500 tons for the twelve months; that they were now asked by the Coal Controller to pay as much as 46s. 3d. per ton, whereas the contract price was 36s. 1½d. per ton; and whether steps could be taken to secure delivery of the coal in accordance with the terms of the contract.

Mr. Bridgeman, who replied, said that from the weekly returns rendered by the Company to the Coal Controller, the quantity of coal received by them since May 1, 1918, was about 4500 tons. It would seem, therefore, that the question alluded to a contract with a particular colliery. Owing to strikes and stoppages at certain pits in Yorkshire and the Midlands, coal deliveries had fallen into arrear; and arrangements had been made by the Coal Controller to forward coal from Durham to a considerable number of gas-works in the South of England, so as to enable them to continue operations. The increase in price appeared to be accounted for by the general increases in colliery prices in June and July last, amounting to 4s. per ton, with additional transport charges on coal that was brought from more distant collieries.

The Halifax Watch Committee have decided that the lighting of the street gas-lamps shall be discontinued from May 18 to Aug. 21 next.

The Croydon Gas Company announce the issue of £20,000 of "D" 5 p.ct. stock, at the fixed price of £80 per £100. Particulars may be had upon application to the Secretary, Mr. W. Toplev.

H.M. Consul for Sicily reports that a firm at Palermo wish to act as agents for United Kingdom firms supplying sulphate of ammonia and nitrate of soda. The name and address may be learned by applying to the Department of Overseas Trade, No. 73, Basinghall Street, London, E.C.2, quoting "Sicily, No. 808."

Coke and Gas Ovens, Ltd., is the title of a new company just registered with a capital of £52,500. The first Directors are Lieut.-Col. A. St. John Cooke and Mr. F. W. Wright; and the offices are at Salisbury House, E.C. Another company is entitled Light Production Company, Ltd., with a capital of £10,000, and offices at Rochester Row, S.W.

MISCELLANEOUS NEWS.

PROTECTION OF OIL-TANKS AGAINST LIGHTNING.

Inquiry by the Petroleum Executive.

Bulletin No. 1 of the Petroleum Executive, which has been published by H.M. Stationery Office, relates to an inquiry into the important question of the protection of oil storage tanks against lightning, and includes a memorandum by Sir Oliver Lodge, F.R.S.

The report is addressed to the Secretary of State for the Colonies (the Right Hon. Walter H. Long, M.P.), and is signed by Sir John Cadman. It points out that the problem of the protection against lightning of petroleum products stored in tanks and reservoirs is one upon which very divergent views have long been held. Some authorities have considered lightning conductors on oil-tanks to be rather a menace than a protection; others maintaining that, though injudiciously placed or defectively constructed conductors might be worse than useless, a good system of conductors is a very desirable safeguard. As there was a direct conflict between theoretical and practical opinion regarding the value of lightning conductors, for this purpose, it appeared very desirable to examine the different views, and, if possible, indicate a course which might be recommended for adoption. Inquiries were therefore instituted by the Petroleum Executive in this country, as well as in the United States of America, where experience on the subject has, of course, been very extensive.

Expressions of opinion are quoted from various petroleum authorities in the United States and in the United Kingdom and India. These views made it quite clear that a statement on the subject should, if possible, be obtained from an eminent physicist; and Sir Oliver Lodge, F.R.S., who had devoted special attention to problems of this nature, very kindly undertook to read through the documents that had been received by the Petroleum Executive, and give the Department the benefit of his views. His report summarizes the whole question of protection of storage tanks from lightning.

Sir Oliver Lodge's Report.

In the course of his memorandum, Sir Oliver Lodge says the protection of oil in metal tanks would seem comparatively easy, because the tank must be a complete metallic enclosure—floor, walls, and roof—and no insulated conductors are likely to be passed through. Hence, if the tank has no leak and no vent, it is absolutely safe, whether earthed or not. But a tank must, I suppose, always have a vent—say, a vertical pipe rising to a certain height. It would be well to cover the mouth of this vent with an open wire cage easily visible from below.

But in so far as vapour is given off, and in so far as leakage of oil is possible, there is always a possible danger of fire; and the fire may be started, not only by lightning itself, but by a very insignificant subsidiary spark, such as is liable to occur in the neighbourhood of a lightning flash in quite unsuspected and unlikely places. I have had sparks occurring, for instance, between gas and water pipes, though, naturally, they were both perfectly earthed; also from a gas-burner to anything near it; and a very small spark is able to ignite gas.

Any oil or vapour, therefore, which escapes from the tanks must be regarded as liable to ignition; and precaution must be taken to prevent the flame from entering the tank. It seems to me that this can be done, on the principle of the safety lamp, by providing the vent with suitable wire gauze; and I take it that no small leak in the tank itself could possibly transmit flame.

Nevertheless, flames in the neighbourhood of oil-tanks are not wanted; and therefore it is undesirable to encourage lightning flashes in their vicinity. For that reason, I should not recommend the attachment of any lightning conductors to the tanks; I should not even recommend the special earthing of the tanks. I do not want them to be regarded by the lightning as a good way to earth. It is preferable that they should not be struck at all, not because of the risk of the lightning getting inside, which is impossible, but because of the danger of accidental and trivial sparks all about the neighbourhood, which might ignite vapour or other inflammable matter; though no doubt precautions are taken for the prompt extinction of these small subsidiary fires, nor would they be likely to occur if everything were air-tight and all joints good. The tightness of joints in pipe-lines becomes, therefore, an important consideration, even from the lightning and fire point of view. Of course, any pipe-line entering a tank should be metallically joined to it where it enters.

There remains the question whether lightning rods at a distance from tanks, either well above them or in a large ring surrounding them, are desirable or not. I am not surprised that these should have been advocated; but on the whole I am disposed to think that they are better away. A lofty, metallic cage surrounding the tank would be duplicating protection unnecessarily, and in a troublesome and expensive manner. A ring of poles all round the tank, if at a considerable distance from it, would not afford much protection; and if too near it, they might accentuate the danger of subsidiary sparks. Hence, on the whole, I think poles are better away. Anything that would encourage a lightning flash in the neighbourhood of tanks is detrimental.

There remains the question whether the use of points for promoting silent discharge—which in the case of buildings is one of their chief functions—should be utilized in connection with oil-tanks and explosive stores. In so far as such points tend to reduce the dangerous tension in the air, they are good; but in so far as they tend to make an easier path for a lightning flash, which might otherwise not occur, they have disadvantages in a place where small sparks and fire are dreaded. I am inclined, on the strength of what I have said, to regard points near oil-tanks as undesirable.

But if an oil-tank has a vent-pipe rising some feet into the air, even though capped by a metal cage, lightning, though unable to enter the pipe, might, if even a small residuary flash struck the cage, ignite some vapour which was issuing therefrom. It is undesirable that vent-pipes should be struck. Hence it would be well to provide an exit for the vapour below the highest point of the pipe, or to prolong the pipe, by rod or otherwise, above the level where the vapour is likely to be. On the whole, however, such vent-pipe would constitute a danger; and it is better that the vent should not protrude—at any rate, not in a vertical direction. Presumably, it might be re-curved downwards, so that the vapour should be delivered at a lower level, where, perhaps, it could be more conveniently collected or dealt with.

On the whole, I am inclined to think that metal tanks, not over elevated and not specially earthed, with good joints and free from leaks, are as safe as anything can well be, provided the roof and other parts are examined from time to time from the point of view of corrosion, the liability to which may be a question of atmosphere.

METROPOLITAN GAS COMPANY OF MELBOURNE.

Half-Yearly Meeting.

Mention was made in the "JOURNAL" last week of the fact that the accounts of this Company for the half year ended Dec. 31 showed a net profit of £107,029; the dividend paid being at the usual rate of 6s. 6d. per share.

Sir JOHN GRICE (the Chairman), who presided at the meeting on Jan. 28, said that, taking first the figures for the whole year, 3435 million c.ft. of gas were sold, as compared with 3223 million c.ft. during 1917. This was an increase of 6·57 p.ct., due largely to the fact that during 1917 the coal miners were on strike, and the Commonwealth Government restricted the use of gas for domestic and industrial purposes, in order to conserve available coal supplies. In the twelve months, the number of meters fixed increased by 2955 to 156,203. Turning to the past half year, receipts from sales of gas amounted to £399,792, as compared with £366,928 in the December half of 1917; while residuals added to the revenue a total of £140,319, against £105,294. The principal increase in residuals was again obtained from sulphate of ammonia, which gave a return of £58,145, as compared with £27,825. The increased price obtained for sulphate of ammonia during the war could not be expected to hold good after the war was over, and shipping facilities from Europe to the East were available. Market quotations since the armistice had been considerably lower; and with the return to more normal conditions, there was no reason to assume a continuation of high prices. The price paid by local buyers had been £18 per ton, and was fixed under the War Precautions Regulations. All additional profit obtained from sulphate of ammonia had been from the buyers outside Australia, and was an addition to Australia's exports. The increased profits from this source had very largely enabled the Company to meet the increased costs of coal and the very high war prices of material, and to avoid materially increasing the selling price of gas. Repairs and renewals of works had been, and would continue to be, extensive. The gasholder at West Melbourne, which was being renewed with an increase in its capacity from 1 to 1½ million c.ft., had been completed. A fourth purifier-house at West Melbourne was in course of erection. This was necessary to provide for the gas from the second and third Woodall-Duckham installations of continuous vertical retorts. The driving of the timber piles to support the foundations of the third installation was nearly completed. This would be followed by the construction of the concrete foundations and the erection of the building and retort-benches, contracts for which had been let. During the six months under review, 9 miles of mains were laid. This figure included part of a very important work—viz., over 2000 yards of a large 30-in. main which was to connect the West Melbourne and the South Melbourne gas-works, and thereby strengthen the supply over the southern area. It was believed this work would be completed before the winter; but great difficulties were being met with in laying this huge main through the city streets, on account of the network of pipes, conduits, and drains that had to be crossed. It would be of great service, and was absolutely necessary for safety purposes.

The Directors were asking authority to issue the small remaining amount of share capital and debentures allowable under the present Act; but the proceeds of these would only help to reduce somewhat the overdraft and deposits. The Government and Parliament had to authorize the issue of any further capital; but so far, notwithstanding the Company's appeals, they had not shown any inclination to do this. Those interested in the progress of the Company knew that the Directors had continuously brought the facts prominently under the notice of each succeeding Cabinet, and were well aware that no Ministry which had yet been in power since 1912 had undertaken to do that which, in the interest of the citizens, was so vitally necessary. The Company were helpless in the matter. Since the last half-yearly meeting, a fresh effort to stir the Government into activity had been made by the Directors, who waited as a deputation upon the Premier, to submit their views on the Company's position.

THE INQUIRY BOARD AND A GAS STANDARD.

The Chairman then proceeded to deal as follows with the questions of standards, &c.: The Gas Inquiry Board, who were sitting at the time of our last half-yearly meeting, concluded their labours; and as the result of their deliberations found that—

(*a*) The records of tests made by the gas examiner show that the gas supplied by the Metropolitan Gas Company is up to the standard of illuminating power and purity prescribed by the Act.

(*b*) There is not sufficient evidence to determine whether the pressure supplied to the consumers is in accordance with section 226, as no regular tests for pressure were taken by the gas examiner.

And recommended—

1.—A standard test by which the total heat value of the gas will be ascertained. This method is in accord with British legislation in recent years.

2.—That the gross heat value be not less than 550 B.Th.U. per c.ft. of gas.

3.—That the illuminating power test shall remain as at present, but only for information purposes until otherwise agreed upon by the municipalities and the Company.

In answer to the question whether there should be a variation in price, consequent on the altered standard, the Inquiry Board stated that, in their opinion, the adoption of the above recommendations should not increase or decrease the present cost of production; and the price of gas would not be affected. As to the suggestion for the adoption of a calorific test in lieu of the present illuminating standard, we have already informed the Government that we have no objection to the substitution of a suitable calorific standard. We strongly contend, however, that in the interests of the consumer who desires to be supplied with gas at as reasonable a price as possible, full consideration should be given to this point. As to the proposed increase in the standard of pressure, this will necessitate a further large expenditure of capital in laying increased sizes of mains, at a time when the cost of these is excessive. The evidence submitted to the Inquiry Board on behalf of the Company went to show that a calorific standard of 500 B.Th.U. gross would be quite a suitable one for adoption in Melbourne, and that it had prior to the war been adopted by the English Board of Trade in dealing with gas undertakings in Great Britain. The Board, however, decided upon a 550 B.Th.U. gross standard. In practically all instances in Great Britain during the war, 500 B.Th.U. has been the general standard. As the result of the experience gained during the past four years, technical and expert opinion would appear to be leading strongly to the conclusion that a gas even lower than 500 B.Th.U. gross is the most economical for the consumer.

The report was adopted, and the Directors were authorized to increase the capital of the Company by the creation of 8558 additional shares of £5 each.

WELLINGTON (N.Z.) GAS COMPANY.

The Annual Meeting of the Company, which was held on Feb. 17, was presided over by Dr. C. Prendergast Knight, the Managing-Director, who moved the adoption of the report, which stated that there had in 1918 been an increase of practically 24 million c.ft. in the quantity of gas sold. After payment for the year of a dividend of 5 p.ct., there was left a balance of £16,198 to be carried forward.

The Chairman said that, in order to meet the abnormal expenditure on coal and wages, the Board decided to increase the price of gas to 6s. 8d. per 1000 c.ft. This increase was not only justified, but inevitable, if the financial stability of the Company was to be maintained. It was an anomaly that, while their Company were heavily taxed, a corporation-owned gas-works paid no taxation whatever on its profits. Prior to the war the position was, to say the least of it, highly inequitable; but since then it had been steadily growing worse from year to year, until at the present time their income-tax alone was £12,800. Trading concerns, whether owned by the Government or public bodies, should be taxed on the same basis as privately-owned undertakings. Coal stocks were very low throughout the Dominion; and at no period had it been possible for the Company to provide a reserve for more than two or three weeks. The year had been a very strenuous one in many respects, and had not been without anxiety to the Board.

The report was adopted without discussion on the part of the shareholders.

NELSON GAS DEPARTMENT REPORT.

Reporting upon the operations for the financial year ended March 31, Mr. Dugald Currie, the Engineer and General Manager of the Borough of Nelson Gas Department, says that the expenditure on revenue account was £85,522, or £1661 more than the estimate; while the income was £95,989, or £9717 more than the sum estimated. The result was a gross profit of £28,329, and a net profit of £10,467. The total cost of the 22,090 tons of coal delivered at the works was £29,416, or an average of 26s. 7¾d. per ton, as compared with 21s. 2d. a year ago. Wages and allowances to dependants of soldiers and sailors totalled £17,372, as compared with £12,859.

The quantity of gas made was 393,948,000 c.ft.; the figure for the preceding year having been 406,635,000 c.ft. In the twelve months just ended, the make of coal gas per ton was 17,810 c.ft., as against 15,046 c.ft. a year ago. The net income from residuals and bye-products was £16,830, against £15,279; the return per ton of coal carbonized being 15s. 2½d. and 11s. 4d. respectively. The quantity of gas delivered (394,157,000 c.ft.) showed a falling off of 3·03 p.ct. on the quantity delivered in the preceding year. The unaccounted-for gas increased from 4·72 p.ct to 5·97 p.ct. There is now a total of 15,435 consumers, 6504 of whom have ordinary and 8931 prepayment meters. The average consumption per ordinary meter was 29,205 c.ft. and per prepayment meter 18,571 c.ft.

The year under review was, Mr. Currie says, from the financial standpoint, the most successful year in the history of the undertaking, notwithstanding the decrease in gas consumption, and the high cost of raw materials and labour charges. The net profit, amounting to £10,467—which is a record for the department—is to a great extent due to the large saving of coal effected by the adoption of up-to-date methods of carbonization. It is estimated that during the past year fully 6000 tons of coal have been saved as a result of "steaming" the charges in the vertical retorts during the process of gas manufacture. With a large reduction in the quantity of coal carbonized, it is obvious a large saving in labour charges has also taken place, which is borne out by the fact that since May 22, 1918, the Nelson works were entirely closed down, and the Brierfield works have been able to provide

USE Simmance's

DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.

Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

all the gas required during the whole period of maximum consumption. The Brierfield installation of vertical retorts, which formerly produced approximately 1,250,000 c.ft. of gas a day, is now, owing to the high yield of gas obtained per ton of coal carbonized, capable of producing fully 1,800,000 c.ft. a day.

EXAMINATIONS IN "GAS ENGINEERING."

City and Guilds of London Question Paper.

The following were the questions put to candidates last Saturday week in the examination in "Gas Engineering," held under the auspices of the City and Guilds of London Institute. The Examiner was Mr. Samuel Glover, of St Helens. The maximum number of marks obtainable is appended to each question.

GRADE I.

1. In the construction of a retort-setting, how does a generator differ from a furnace (*a*) in construction, (*b*) in working? (40 marks.)
2. What difference has of late years been made in the degree to which a retort is charged? What general effect has the difference you have noticed had upon the products from the charge and upon the retort-house apparatus? (45.)
3. What is a condenser on a gas-works; in what position on the works is it generally fixed; and what effect has it upon the gas and bye-products produced? (40.)
4. If the exhauster connected to a gas-making plant is considerably too large for its general work, how should it be connected-up and controlled to ensure its work being performed in a steady and reliable manner? (40.)
5. What are the impurities that need to be removed from coal gas after it has passed the exhauster? How are they best removed? To what extent are they removed in a well-conducted works? Give the chemical changes, where possible. (45.)
6. For what useful qualities should (*a*) coal gas, (*b*) water gas, when stored ready for distribution, be tested? Describe the tests to be applied in each case. (35.)
7. Describe the best method of storing and using the washing liquors used in the process of coal-gas washing, how they are applied to the best advantage, the work of purification performed, and the valuation tests to which the liquor is submitted. (30.)
8. Show, by a general sketch, a modern sulphate of ammonia plant, placing in line the several parts in their best relationship for use and ready control, and to allow of easy cleaning and repair. (40.)
9. State the advantages and disadvantages of (*a*) wet, (*b*) dry gas-meters, especially in relation to modern methods of gas manufacture and distribution. (30.)
10. Describe the best form of an incandescent gas-lighting burner and mantle, and give the efficiency in candles per cubic foot of gas used per hour, stating the quality of gas used. (30.)

FINAL.

1. Describe how the working temperature within a retort-setting is generated from (*a*) a direct-fired furnace, (*b*) a generator furnace, (*c*) a regenerator furnace. State the influence of the three systems of heating on the percentage of fuel used per 100 lbs. of coal carbonized, and state the area of the grate-bars in relation to the work to be done. (45 marks.)
2. What new methods of working retorts have been recently adopted enabling the gas maker to produce from each ton of coal a greater total of gaseous energy than was previously obtained? (40.)
3. How is the process of condensation best carried out on a gas-works so as to reduce the risk of subsequent trouble from naphthalene deposits and the prevention of trouble in gas-meters, and to secure the provision of the most reliable gas for distribution? (40.)
4. What are the advantages and disadvantages of the following methods of driving exhausting machinery on a gas-works: (*a*) A reciprocating steam-engine, (*b*) a steam-turbine, (*c*) a gas-engine, (*d*) an electric motor? (40.)
5. State the percentages of gaseous impurities in crude coal gas; give the chemical and physical changes involved in the usual methods adopted for their removal. To what extent are the impurities removed, and at what cost per 1000 c.ft. of gas manufactured, taking into account the value of the products recovered? (45.)
6. Give what you consider to be the most useful quality of gas that can be generally distributed for the economical production of light, heat, and power, stating the limits of inerts attainable in good manufacturing practice. (35.)
7. Draw a section through a purifier-box, showing its construction and the best internal equipments you know to secure regular work with the fewest changes. Specify the quality of material used in the construction of the box and cover. What area would you provide per million c.ft. of gas per day? (40.)
8. Show by the help of sketches on a cross section of a gasholder where you would specify for the use of wrought iron or cast iron, or wrought steel or cast steel. (35.)
9. What are found to be the most effective means of reducing the percentage of unaccounted-for gas? State what you know to be usual percentages, and say to what figure modern working can attain, and by what means it is attained. (30.)
10. Describe the instrument used as a gas-leakage indicator; state the physical law according to which it is constructed, how it is used, and how it is kept ready for prompt use. (30.)
11. To coal gas having the following percentage composition, H, 48·00, CO, 7·00, CH_4, 35·00, C_2H_4, 3·00, CO_2, 1·25, N, 4·00, add (*a*) 25 p.ct. of blue water gas, (*b*) 40 p.ct. of the same gas. Give an analysis of the two mixtures and state the calorific value of each. Briefly discuss the results you would expect to get in using the above mixtures in apparatus as constructed for ordinary use. (45.)

R. & A. MAIN, LTD.,

Cooking and Heating Engineers and Ironfounders,

GOTHIC WORKS, ANGEL ROAD, EDMONTON,
LONDON, N.18.

NOTICE.

We regret we are temporarily unable to receive or send telephonic communications at our Head Office and Works owing to the telephone lines in the district being blown down during the recent bad weather.

In the meantime, telephonic communications may be addressed to our

London Showrooms:

25, PRINCES STREET, OXFORD CIRCUS, W.1.

Telephone No.: MAYFAIR 384.

These communications will be sent on to us immediately by hand.

CHELMSFORD GAS-WORKS TRANSFER.

The Provision of the Purchase Money.

In connection with the removal of restrictions on capital issues by local authorities, the Gas Committee of the Chelmsford Corporation report that their Act of 1915 provides that, if the Treasury refuse their consent to the borrowing by the Corporation of the money required for paying the purchase money, the Gas Company shall not be entitled to require the Corporation to pay until one month after such consent is given or the necessity for such consent ceases, whichever is the earlier; and that if the Corporation shall not pay the purchase money on the date of consent, they shall pay to the Gas Company interest at the rate of 10 p.ct. per annum from the date of consent until payment. The words "date of consent" are defined as meaning one month after the consent of the Treasury has been obtained to the borrowing by the Corporation of the money required, or the necessity for such consent ceases, whichever is the earlier. As the necessity for obtaining the consent of the Treasury to the borrowing of the amount of the purchase money of the undertaking of the Chelmsford Gas Company would expire on May 2, the Committee directed the Town Clerk to approach the Company and ascertain whether they were willing to extend the period for the payment of the purchase money without requiring the payment of interest at the rate of 10 p.ct. per annum, until such time as the Corporation have had reasonable opportunity to raise the necessary loan.

In the event of the Company not consenting to extend the period of one month from April 2 for the payment of the purchase money without requiring the payment of interest as from May 2, the Committee recommend that the Chairman and Town Clerk be empowered to negotiate on the best possible terms a temporary or short term loan of £86,056, being the amount required. The Committee also recommend the Council to at once invite tenders by advertisement for the approximate amount which will be required to defray the purchase price of the undertaking and the expenditure payable by the Corporation in connection with the acquisition of the gas undertaking and the erection of the new holder.

Contemplated Extensions at Coventry.—Considerable extensions to the gas undertaking are contemplated by the Coventry City Council, to meet the growing demand and the prospective enlargement of the city boundaries. A recommendation from the Gas Committee has been adopted to apply for the following necessary powers: (1) To borrow £500,000 for the extension of manufacturing plant; (2) to acquire additional land for gas making plant; (3) to extend the area of supply so as to include the parishes of Wyken, Binley, and Walsgrave-on-Sowe; and (4) to adopt a calorific standard of gas of 450 B.Th.U. in place of the illuminating standard of 15 candles as prescribed by the Coventry Corporation Gas Act, 1898.

NATIONAL SULPHURIC ACID ASSOCIATION.

On April 28, there was registered, as a Company limited by guarantee, the National Sulphuric Acid Association, Ltd., with an unlimited number of members, each liable for one guinea in the event of winding-up.

The objects are to establish the sulphuric acid industry of the United Kingdom on a permanently prosperous basis, commercially and scientifically, having regard to the necessity of its maintenance as a key industry in relation to the needs of other industries (particularly in time of war); to promote the discussion of all questions affecting the interests of the said industry; to create new outlets for the consumption of sulphuric acid; to devise means of disposing of surplus sulphuric acid production; to give effect, so far as lawfully may be, to the recommendations contained in the "Report of a Departmental Committee on the Post-War Position of the Sulphuric Acid and Fertilizer Trades," appointed by the Minister of Munitions in February, 1917; to promote excellence, economy, efficiency, and co-operation in relation to the manufacture and distribution of sulphuric acid, &c.

Ordinary members are to be classified into: London and Eastern Counties Section; West of England and South Wales Section; Midlands Section; Lancashire, Cheshire, and North Wales Section; Yorkshire and Lincolnshire Section; North of England Section; Scottish Section; Irish Section. Messrs. S. Mount and J. K. Stewart are Joint Secretaries, with a registered office at No. 166, Piccadilly, W.

The first Council consists of 26 members, including Mr. D. Milne Watson, Alderman W. Kay, Mr. E. P. Chance, Mr. J. N. Holden, Sir William Pearce, M.P., and Mr. S. Sadler.

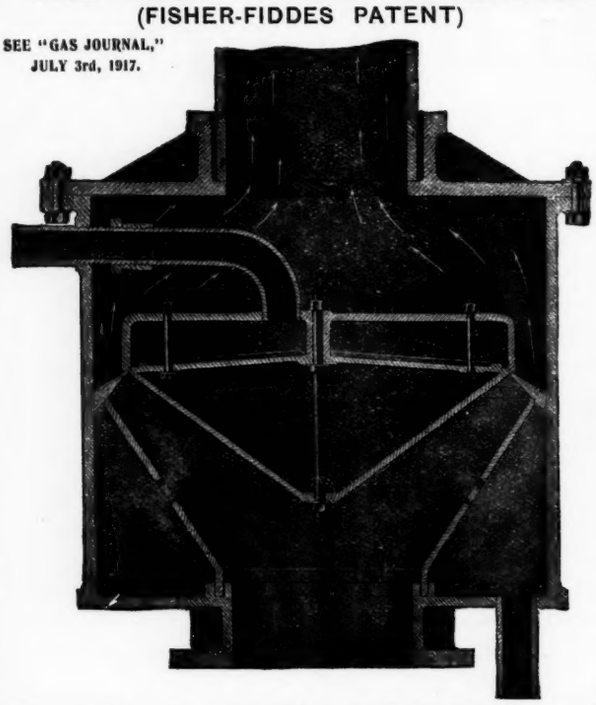
The Fertilizer Manufacturers' Association, Ltd., was registered on the same day—among other objects, to take over the assets and liabilities of the unincorporated Association of similar name. The Secretary is Mr. J. K. Stewart, No. 70, Fenchurch Street, E.C.

THE LARGEST GAS UTILITY COMPANY.

The first article in a "Big Business Number" of the New York "Gas Age" claims that the Consolidated Gas Company of New York holds the world's record in a number of important engineering and business enterprises.

This "Largest Gas Utility Company" in the world, it is said, paid out in taxes during 1918 the sum of $8,534,319, and for additions and extensions $6,014,579. The last annual report showed that the Company had in service 964,055 gas-meters, and 370,567 electric meters, through which were sold 32,088,377,900 c.ft. of gas, and 756,649,203 kilowatt-hours of current. The Company have out on rental a total

"TAR FOG" & TAR EXTRACTOR
(FISHER-FIDDES PATENT)
SEE "GAS JOURNAL," JULY 3rd, 1917.



FOR THE
ELIMINATION OF
TAR & TAR FOG
FROM COAL GAS AND
OIL VAPOURS
FROM C.W. GAS
WHY NOT TRY THE
NEW METHOD

AUTOMATIC
EFFECTIVE &
INEXPENSIVE

PARTICULARS AND PRICES FROM
R. & J. DEMPSTER, LTD., MANCHESTER.
Temporary London Office: BLENHEIM MANSIONS, BROADWAY, WESTMINSTER, S.W. 1.
London Office Telephone No. Vic. 7426.

of 460,720 gas cooking appliances; and to ensure satisfaction nineteen experts made 28,378 inspections, while fifty women demonstrators instructed 168,906 customers in gas cookery and the proper manipulation of ranges. The Company make their own ranges, and turned out 31,000 last year; there being altogether 125,000 of them in use. The office building of the Company is thought to be the largest devoted entirely to the housing of lighting companies. It is nineteen storeys high, and has a total floor area of 404,450 sq. ft.

In 1906, the Astoria Light, Heat, and Power Company (a subsidiary of the Consolidated Gas Company) erected at Astoria (Long Island) a 15 million c.ft. holder, in a concrete sub-surface tank. The first steel tank holder of a capacity of 10 million c.ft., is stated to have been installed by the Consolidated Gas Company in 1911, at Kingsbridge; and the other, following the same design, was built by the Brooklyn Union Gas Company, at Newtown (Long Island). The total holder capacity in use by the Consolidated Gas Company and subsidiaries is 123 million c.ft.; while the mains total 2647 miles. There are two 72-in. cast-iron gas-mains running through the tunnel under the East River from Astoria to Port Morris. The two total 10,327 ft. in length, and are said to be the largest cast-iron gas-mains in the world; while the 60-in. riveted steel main, 14,965 ft. long, running from Astoria to Ravenswood, is the largest gas-main of its kind. The tunnel for carrying the 72-in. gas-mains [an illustrated description of which has appeared in our pages*] is 4662 ft. long and 21 ft. in diameter, and is the largest tunnel used for the purpose of transferring gas under a river. The plant of the Astoria Light, Heat, and Power Company, which is erected upon an area of 376 acres, is only exceeded in size by the Beckton plant of the Gas Light and Coke Company. It has a daily rated capacity of 45 million c.ft., 25 million c.ft. of which is water gas. On one occasion in the winter of 1917-18, this water-gas plant, in meeting a great emergency, produced 29,809,000 c.ft. of gas. The output of the Consolidated and affiliated Companies broke all their previous records during 1918; the total quantity credited being 55,775,800,000 c.ft. The maximum day's output was 160,077,000 c.ft.

As to war-time operations, during the period of approximately six months there were extracted from the gas made by these Companies 2,344,618 gallons of benzol, 1,551,027 gallons of toluol, 883,301 gallons of solvent naphtha, and 715,814 gallons of crude still residue. The Consolidated and Astoria Companies produced also practically the whole of the material used in the canisters of the gas masks for the American forces. The total quantity of carbon turned out in about a year was 6,433,741 lbs.

* See "JOURNAL," Vol. CXXXII., pp. 251, 316.

Output of Gas at Halifax.—In his monthly statement to the Halifax Gas Committee, the Engineer (Mr. W. B. M'Lusky) reported that during the financial year the quantity of gas sent out amounted to 800,233,000 c.ft., as against 881,763,000 c.ft. in the preceding year—a decrease of 9·24 p.ct.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 5.

Pitch maintains a steady tone; the price being firm at over 65s. per ton net in bulk at makers' works. Shipments continue to be made regularly. Creosote is steady at from 6d. to 6½d. per gallon net and naked at makers' works. Benzol is in good demand as a motor fuel. Solvent naphtha is quiet at about 2s. 6d. per gallon net and naked. Toluol is also quiet at about 3s. per gallon.

In sulphate of ammonia, there is nothing new to report.

Tar Products in the Provinces.

May 5.

The average values for gas-works products during the week were: Pitch, East Coast, 51s. 6d. to 52s. 6d. per ton f.a.s.; West Coast—Manchester 44s. to 45s.; Liverpool, 45s. to 46s., Clyde, 46s. to 50s. nominal. Benzol 90 p.ct., North, 1s. 9d. to 1s. 11d.; crude, 65 p.ct., at 120, 1s. 1d. to 1s. 2d.; 50-90 p.ct., naked, North, 1s. 9d. to 1s. 10d. Toluol, naked, North, 2s. to 2s. 1d. nominal. Coal tar crude naphtha in bulk North, 8d. to 8½d. Solvent naphtha, naked, North, 2s. to 2s. 2d. Heavy naphtha, North, 2s. 7d. to 2s. 8d. Creosote, in bulk, North, salty, 4½d. to 5d.; ordinary liquid, 5d. to 5½d. Heavy oils, in bulk, North, 6d. to 6½d. Carbolic acid, 60 p.ct., unsaleable. Naphthalene, £18 to £22; salt, £6 to £7, bags included. Anthracene "A" quality, 6d. to 7d. per minimum 40 p.ct.; "B" quality, 2d. nominal.

Manchester District Tar Prices.

The average price realized for tar in the Manchester district, based on the value of the products, for the month of March was £2 7s. 7d. per ton.

FROM A MARKET CORRESPONDENT.

Tar Products.

A quiet feeling prevails generally, although there are signs of increased activity in several directions. Crude tar continues to fetch fairly good prices, and the demand for prepared qualities for road purposes seems likely to improve. Pitch prices are well maintained, both in London and the Provinces—Manchester even showing an advance of about 1s. 6d. on the week. There is good forward inquiry, and the outlook appears favourable. Belgium is in the market for large quantities; and shipments from Provincial centres are of rather more generous proportions than of late. Manchester alone last month shipped 2300 tons, out of a total for the whole country of 75,000 tons. With gradually improving shipping facilities, a much larger business should be

SAWER & PURVES,

THE POSITIVE DRY PREPAYMENT METER

MANCHESTER & NOTTINGHAM.

done. Creosote remains a very firm market; but naphthalenes continue flat, and prices for cheaper crudes tend to a lower level. Refined is off-colour, and is quoted at less than a week ago—there being but a limited demand. Naphthas are irregular. The heavy is dull and lower; but there seems to be rather more business in solvent than for some weeks past. Whether quotations have reached bedrock is still doubtful. Toluol is without change; but benzol derives support from the Chancellor of the Exchequer's proposal to give legal authority for the exemption of it from taxation by repealing the Excise duty. The concession is an important one; and although it is a very tardy recognition of the part played in the war by the industry—which I believe, in its present form is due to the foresight of one of our leading iron and steel companies, and not to any prescience or initiative of any official department, as the Chancellor would have us believe—it will to a small extent compensate for the difficult and unprofitable nature of the business during the war. The demand for benzol is now heavy. It is evident that prejudice against it, as compared with petrol, is quickly disappearing; and it is not unlikely that the present output will fall short of the demand. Had the gas industry received reasonable concessions regarding price during the war, the output would have been greater; but it is not too late for an official notice to the gas industry that, in view of motor fuel requirements, the continued abstraction of benzol is a matter of national importance. The gas industry, however, is nothing if not progressive, and possibly the prospects of increased trade will be sufficient incentive to that end. Other products are without change.

The range of home quotations is as follows:

Benzol: 90% London 2s. to 2s. 2d., North 1s. 11d. to 2s.; 50-90% 1s. 9d. to 2s. London, 1s. 9½d. North; crude 60-65% 1s. 6½d. to 1s. 7½d.; pure, 2s. 6d. per gallon naked.

Carbolic Acid: Crude 60's unsaleable; crystals, 40%, 4d. per lb. asked.

Crude Tar: London, 42s. to 44s.; Midlands, 38s. to 40s.; North 38s. per ton *ex* works.

Pitch: London, 65s. to 70s. per ton; East Coast, 49s. to 52s. per ton; West Coast, 45s. to 47s., with Manchester 47s. per ton and Glasgow 47s. 6d. per ton; South Wales, 56s. to 58s. per ton.

Solvent Naphtha: London, 2s. 1d. to 2s. 4d. Provinces average 2s. 2d. per gallon.

Crude Naphtha: Naked, 10d. per gallon.

Heavy Naphtha: 2s. 4d. per gallon.

Naphthalene: Refined, £18 to £19 per ton nominal; crude, £5 10s. to £10, according to quality.

Toluol: Naked, 2s. 1d. to 2s. 3d. per gallon nominal.

Creosote: London, 7¾d.; North, 6¾d. to 7d.; heavy oil, 6d. per gallon in bulk.

Anthracene: 40-45%, 5d. to 8d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Aniline Oil: 1s. 2d. per lb.

Cresylic Acid: 95%, 3s. to 3s. 3d.; 97-99%, 3s. to 3s. 6d. *ex* works London; f.o.b. other ports.

Sulphate of Ammonia.

There is very little fresh news regarding sulphate of ammonia. I am given to understand that prices for home supplies during the year have already been fixed, and that they are more favourable to the farmer than to the producer. Competition abroad is going to be very keen indeed; America for one part being, as I showed last week, in a position to compete particularly for trade in the Far East. Japan also is able to export large quantities; and we must not overlook another very important factor bearing on export values—namely, the German position and the commercial safeguards to be imposed by the peace treaty. It is obvious, therefore, that the home trade must be encouraged, and, consequently, the requirements of the agricultural community must be considered. In the long run it is thought that it is as well for manufacturers to accept the proposed schedule of home prices. The position generally is gradually becoming clearer.

Labour Day Lighting in Ireland.—The complete stoppage of industry of all classes in Dublin and in most of the Irish provincial centres, outside the Belfast area and some other portions of Ulster, on May 1, in observance of "Labour Day," led, of course, to a serious curtailment in gas and electric light consumption; but supplies were available for household and street lighting.

Extended Use of Gas at Darlington.—Mr. C. F. Dixon, the Chairman of the Darlington Corporation Gas Committee, in moving the adoption by the Council of his Committee's minutes, said the output of gas was 83,103,000 c.ft. more in 1918 than in 1914, equal to an increase of 20 p.ct., notwithstanding that all street lighting had been discontinued, which represented 20,000,000 c.ft. of gas per annum. The coal carbonized in 1918 was, however, 387 tons less than in 1914, though the gas output was so much greater. As compared with 1914, there were 861 more ordinary cookers, 909 more gas-fires, and 1394 slot-cookers in use in 1918—an extraordinary increase in view of the fact that very few new houses had been built in the five years.

The Coal Situation at Leeds.—The Leeds Gas Department are becoming increasingly anxious as to the coal situation. Normally the supplies are drawn from pits near at hand, in the West Riding; but since the coal control, the West Yorkshire coal—even that produced at Middleton, on the doorstep of Leeds—has gone to the South of England; while Leeds has had to be content with inferior coal from Durham, at 7s. 2d. more per ton. The coal bill of the department has, from this cause alone, been increased by from £3000 to £4000 per month; and another advance in gas prices, of 6d. per 1000 c.ft.—bringing the charge to 4s. 6d. per 1000 c.ft.—is in contemplation, unless something is quickly done by the Control Department. The Coal Controller was interviewed about a couple of months ago on behalf of the Leeds undertaking; and the reception was such as to give rise to hopes that a variation in the control would shortly be made, to allow the revival of contracts with West Yorkshire collieries. But since that date nothing further has been heard; and the certainty of a big deficit, unless it is avoided by the proposed increase, is growing rapidly.

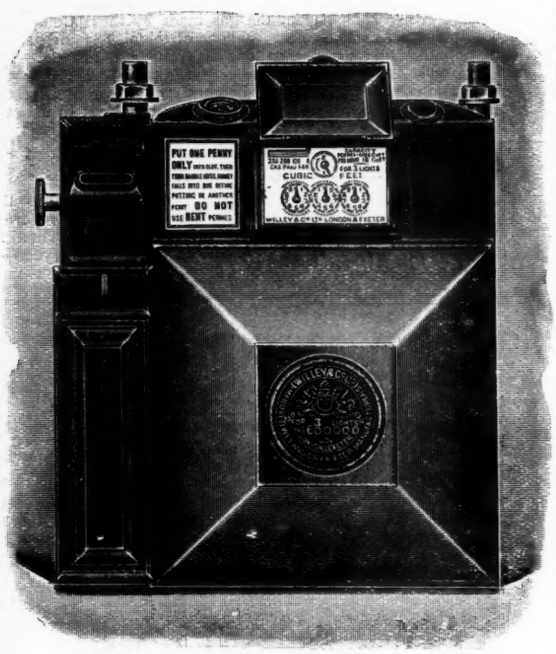
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD.,

Exeter, London, Manchester, Leicester.

Telegrams:
"WILLEY, EXETER."
"GASVILLADO, KINLAND, LONDON."
"METERS, LEICESTER."
"WILMETER, MANCHESTER."

Telephone Nos.:
183 EXETER.
294 DALSTON, LONDON.
4777 LEICESTER.
7419 CITY (MANCHESTER).

LONDON WORKS & OFFICES:
89-95, Hertford Road, Kingsland, N.
LEICESTER:
5, Oxendon Street.
MANCHESTER:
John Street, Booth Street West, S.W.

AGENTS FOR SCOTLAND:
D. M. NELSON & CO., 20, WEST CAMPBELL ST., GLASGOW

Renting Gas Appliances for Small Houses.—Upon the Halifax Gas Engineer (Mr. W. B. M'Lusky) reporting that new and improved appliances were available for lighting, cooking, and heating, the Gas Committee resolved that, with a view to enabling small consumers of gas to obtain the advantage of the new apparatus, the Committee agree to provide, deliver, and fix on application an efficient boiling-ring in the kitchen and a standard gas lighting burner in the kitchen or living-room of every small house in the town, at a rental of 1s. 8d. per quarter.

Floods and Gas Supply in Melbourne.—Complaints with regard to want of pressure for some days in the gas supply of Melbourne, led to an explanation by the Metropolitan Gas Company that the failure was due to an interference with the carbonizing plant at South Melbourne by flood waters during a very heavy downpour of rain. A portion of the plant in one of the retort-houses at the South Melbourne works was completely inundated for some time, with the result that the coal conveying machinery was put entirely out of action. The work consequently had to be carried on by hand; and this naturally greatly interfered with the quantity of gas manufactured. Immediate steps were taken to overcome the difficulty.

Increase in Price at Gomersal.—Owing to still increasing costs of production, the Gomersal Gas Company have further advanced the price of gas by 4d. per 1000 c.ft. to both private consumers and the district councils who use the Company's service.

Price of Gas Stoves and Meters.—Reporting to the Chelmsford Corporation Gas Committee, the Engineer and Manager (Mr. E. W. Smith) states that inquiries are now becoming fairly numerous for gas cooking-stoves and slot-meter installations to be provided; but though the Ministry of Munitions restrictions have to a great extent been removed, materials are still difficult to obtain delivery of, and prices are very high. The particular class of "slot" cooking-stove purchased for 28s. 4d. before the war, costs to-day 61s. 3d. net. The total cost of fitting-up small houses in the district, including connections to mains, providing meter, stove, and lights for living-rooms, but excluding incandescent burners, averaged before the war about £4 10s. per house. For a similar installation, the cost will now be about £9. The question arises as to whether the work of adding new consumers should at the present time be taken up so vigorously as was the case in the pre-war days, when the expenditure under this head amounted to close on £500 a year.

STOCK MARKET REPORT.

ANOTHER syncopated week—May 1 being an annual closure—cut up business on the Stock Exchange; but it did no great harm. Quietude was already imposed at the opening by storm interruptions, and lasted more or less the next two days. The blank day then gave time to ponder on the Budget; and the result appeared to be favourable, judging by the general tone upon reopening.

In the gilt-edged market, Home Government issues (except War Bonds) weakened; Loans ruling quite easy, until Friday, when they rallied smartly. The 5 p.ct. reached 94 1/16, and the 3½ p.ct. rose also. Home Rails took a better turn, with a welcome recovery. Canadians and Argentines improved in strength.

In the Foreign Market, French effected a material advance, and the Russian demand continued. Among Miscellaneous, activity and strength were prominent in many lines.

Business in the Gas Market was remarkably active, thanks in large measure to the run on two undertakings. Imperial Continental was very firm and steady; being dealt in daily between 134 and 136, with a rise of 2 in the quotation. Primitiva provided the lion's share of bargains; the daily returns being extraordinary. The ordinary shares rose from 28s. 9d. to 37s. 6d., and the preference from 50s. to 62s. 6d.—an advance of 30 p.ct. and of 25 p.ct. respectively.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin 50¼, 50½, British 31½, Continental Union 49½, Gas Light and Coke 62½, 62⅝, 63, ditto maximum 55½, ditto preference 70, ditto debenture 57⅛, Imperial Continental 133½, 134, 134¼, 135, 135½, 136, Metropolitan of Melbourne 96¼, Monte Video 9⅜, 9⅞, Primitiva preference 50s. 5½d., 52s. 6d., 53s. 1½d., South Metropolitan 62, British 3 p.ct. debenture (Norwich) 48, Chester 3½ p.ct. debentures irredeemable 57⅞, Metropolitan of Melbourne shares 8 3/16, 8¼. On Tuesday, Bournemouth 10 p.ct. 20, European 12½, Gas Light ordinary 62½, 62⅝, ditto maximum 56½, ditto preference 70⅛, ditto debenture 56½, 57¼, Imperial Continental 134¼, 135, 135½, 136, Metropolitan of Melbourne 96½, Primitiva 28s., 29s. 9d., 30s., 31s. 3d., ditto preference 51s. 3d., 51s. 10½d., 52s. 6d., 53s., 53s. 1½d., 53s. 9d., 54s. 4½d., 54s. 6d., 55s., 56s., ditto (1911) 52, River Plate 50, North Middlesex preference 76½, 77. On Wednesday, Brighton and Hove original 138, ditto ordinary 95, British 30⅞, 31⅛, Commercial debenture 59½, Croydon "A" 156, ditto "B" and "C" 131, Gas Light ordinary 62, ditto preference 70, ditto debenture 56½, Imperial Continental 134, 134½, 134⅜, 135, 135½, 136, Primitiva 30s. 3d., 31s., 31s. 10½d., 32s. 6d., 35s., 37s. 6d., ditto preference 56s. 3d., 56s. 9d., 57s. 6d., 58s. 1½d., 58s. 9d., 59s. 4½d., 60s., South Metropolitan 62, 62¼, 62⅜, 63. On Friday, Alliance and Dublin 49, 49¼, Cape Town preference 8, Gas Light and Coke ordinary 61½, 62, 62½, ditto preference 70, 70½, ditto debenture 57¼, 57½, ditto 10 p.ct. bonds 169½, Imperial Continental 134, 134½, 135, 135½, 135⅝, 135¾, 135⅞, 136, Primitiva 33s. 9d., 35s., 36s., ditto preference 60s., 60s. 3d., 60s. 7½d., 61s. 3d., 62s. 6d., South Metropolitan 62, 62¼, 62⅜, South African 13, South Suburban 78, 78½, 79, Tottenham debenture 65½, Bournemouth 3 p.ct. debenture 51, 51½, Brighton and Hove 6 p.ct. preference 96.

In the Money Market, rates ruled firm at first, but relaxed as the week proceeded. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
183,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	62—67	..
1,651,868	"	April 8	2½	2⅞	Alliance & Dublin Ord.	50—50	48—50	49—5
374,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	61—63	..
280,000	5	April 29	7½	8%	Bombay, Ltd.	5⅞—6⅛	5⅞—6½	..
60,000	10	Feb. 26	16	12%	Bournemouth Gas and Water { 10 p.c.	29—30	20—22	20
888,110	10	"	7	7%	B 7 p.c.	15—15½	10—11	..
115,000	10	"	6	6/-	Pref. 6 p.c.	13½—14	9—9½	..
159,740	—	—	—	4%	4 p.c. Deb.	..	66—68	..
992,045	Stk.	Feb. 26	14	37/-	Brentford A Consolid.	261—266	76—79	..
784,990	"	"	11	31/8	Do. B New	204—209	70—75	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	78—83	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—93	65—67	..
217,880	"	Feb. 26	11	7½%	Brighton & Hove Orig.	208—213	137—142	138
244,200	"	"	8	5½%	Do. A Ord. Stk.	154—159	94—99	95
933,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
580,000	20	Mar. 26	12½	10%	British	44—45	30¾—31½	30¾—31½
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	..
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—53	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	4½—4⅝	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7⅛—8½	8
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,518,280	"	Feb. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	62—65	..
560,000	"	"	5½	26/8	Do. 3½ p.c. do.	103—105	59—62	..
475,000	"	June 11	8	8%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53	50½
800,000	"	"	4	—	Continental Union Ltd.	76—79	48—53	49½
200,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	70—75	..
51,600	Stk.	Aug. 29	14½	12½%	Croydon A 10 p.c.	..	155—165	156
278,400	—	"	11½	9½%	Croydon B and C 7 p.c.	..	130—135	131
499,270	Stk.	—	6	5½%	Derby Con. Stk.	128—135	..	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	..	..
1,009,180	10	July 29	10	5/0	European, Ltd.	17½—18	12½—13½	12½
16,298,975	Stk.	Feb. 10	4/17/4	80/-	Gas Light and Coke { 4 p.c. Ord.	98—102	61—63	61½—63
2,600,000	"	"	8½	26,8	3½ p.c. max.	76—79	55—57	58⅛—56½
4,069,285	"	"	4	4%	4 p.c. Con. Pref.	96—99	70—72	70—70½
4,674,850	"	June 11	8	8%	and 3 p.c. Con. Deb.	73½—74½	56—53	56½—57½
180,000	"	"	10	10%	Coke 10 p.c. Bonds	..	..	169½
82,500	"	Mar. 12	5	4½%	Hastings & St. L. 5 p.c.	..	59—64	..
258,740	"	—	3½	2¾%	Do. 3½ p.c	87—89	44—49	45
70,000	10	April 29	11	7%	Hongkong & China, Ltd.	16½—16⅝	7⅛—8⅛	..
86,600	Stk.	Sept. 12	9	8½%	Hornsey 7 p.c.	..	115—120	..
181,000	"	Mar. 12	7½	5½%	Ilford A and C.	151—154	90—95	..
65,780	"	"	6⅜	4½%	Do. B	115—118	69—74	..
65,600	"	June 26	4	4%	Do. 4 p.c. Deb.	92—94	62—65	..
4,940,000	"	May 14	9	4½%	Imperial Continental	150—160	133—138	133½—136
1,986,000	"	Feb. 12	8½	8½%	Do. 8½ p.c. Deb. Red.	84—86	72—74	..
285,249	"	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	80—95	..
3,498,905	"	Feb. 26	10	42/6	Liverpool 5 p.c. Ord. { A	211—213	..	..
					{ B	146—148		..
806,088	"	June 26	4	4%	Do 4 p.c. Pr. Deb. Stk.	..	..	..
165,736	"	Feb. 17	7/5/6	35%	Maidstone 5 p.c.	..	58—63	..
75,000	5	June 11	6	3%	Malta & Mediterranean	4½—4⅝	3½—3⅝	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	90—97	96½—16½
541,930	20	May 26	4	6/-	Monte Video, Ltd.	11½—12	9½—10	9⅜—9⅞
1,875,893	Stk.	July 29	4½	8½%	Newcastle&Gatsh'd Con.	98½—99½	70½—71½	..
559,705	"	June 26	8½	8½%	Do. 3½ p.c. Deb.	82—83	57—59	..
55,940	10	Feb. 26	7/14/0	7½%	North Middlesex 7 p.c.	14—15	9½—9⅞	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	103—106	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	4⅞—5⅛	..
60,000	50	Feb. 26	18	7½%	Portsea, Island B	126—131	76—81	..
100,000	50	"	12	6½%	Do. C	118—121	58—63	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1½—2	28/6—37/6
499,960	100	June 26	5	—	Do. 5 p.c. Pref.	4½—5	2½—3½	50/—62,6
891,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	74—76	..
£00,000	Stk.	July 31	4	4%	Do. " " 1911	..	50—52	52
846,198	"	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	48—52	50
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	7½—8	..
125,000	50	July 1	5	5%	{ 6 p.c. Deb.	47—49	40—42	..
135,000	Stk.	Mar. 12	10	5%	Sheffield A	238—234	80—84	..
209,984	"	"	10	5%	Do. B	232—234	80—84	..
538,500	"	"	10	4¾%	Do. C	230—232	71—74	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 28	9	6/-	South African.	10½—11½	13—14	13
6,609,895	Stk.	Feb. 10	5/4/0	80/-	South Met. 4 p.c. Ord.	111—113	62—65	62—63
250,000	"	July 12	—	5%	Do. Pref.	..	95—97	..
1,895,445	"	July 10	8	8%	Do. 3 p.c. Deb.	73¼—74½	54—56	..
224,220	"	Feb. 26	8½	5%	South Shields Con. Stk.	157—159	111—113	..
962,795	"	"	6	3¾%	S'th Suburb'n Ord. 5 p.c.	114—116	76—79	78—79
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	89—92	..
647,740	"	May 14	8	8%	Southampton Ord.	99—102	69—71	..
130,000	"	Feb. 12	7½	4¾%	Tottenham { A 5 p.c.	135—138	90—95	..
762,975	"	"	6	3⅞%	District { B 5½ p.c.	115—117	65—67	..
181,355	"	June 26	4	4%	{ 4 p.c. Deb.	87—89	65—67	65½
182,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½—109	83—85	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	"	Feb. 26	8⅜	55/-	Wandsworth A 5 p.c.	151—156	88—93	..
255,536	"	"	6⅜	40/-	Do. B 5½ p.c.	129—134	68—73	..
108,975	"	"	—	38/6	Do. C	..	68—73	..
140,865	"	"	—	38/6	New Ordinary	..	68—73	..
262,000	"	"	6½	33/9	Wimbledon 5 p.c.	117—123	68—73	..
98,000	"	"	6⅜	40/-	Epsom 5 p.c.	121—126	70—75	..
88,416	"	June 26	3	3%	3 p.c. Deb. Stk.	66—69	50—52	..

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under (about 40 words) 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.	HALF-YEAR.	QUARTER.
United Kingdom	Advance Rate:	28/-	15/-	8/8
	Credit Rate:	32/-	16/-	9/6
Abroad (in the Postal Union) Payable in Advance		32/6	17/-	10/-

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

Price 21s. net, Post Free in the United Kingdom.

THE EIGHTH EDITION OF NEWBIGGING'S HANDBOOK FOR GAS ENGINEERS AND MANAGERS.

(With PORTRAIT of WILLIAM MURDOCH as a Frontispiece).

In order to keep pace with the improvements that are being made in every department of the Gas Industry, it has been found necessary, in this the Eighth Edition of the Handbook, to extend the text, to largely rewrite it, and to add a number of new illustrations.

Special care has been taken to make the carbonization portion as full and complete as possible. Indeed, in almost every department additional useful matter has been introduced.

It is hoped that these efforts to bring the work up to date will be appreciated by readers, and help to maintain the high reputation of the book as a work of reference.

Orders may be sent through any Bookseller, or direct to the Publisher,

WALTER KING, "GAS JOURNAL" OFFICE, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

OXIDE OF IRON

FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE

PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C. 2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

FOR Supplies of SULPHURIC ACID,

ASK BERK.

F. W. BERK & CO., LTD., 1, FENCHURCH AVENUE, LONDON, E.C. 3. Works: STRATFORD, LONDON. MORRISTON (GLAM.).
Phone: 4032 Avenue. Tele: "Berk, Phone London."

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 25, p. 410.

ALDER AND MACKAY, LTD.
(ESTABLISHED 1850).
WET AND DRY METERS,
SLOT AND ORDINARY.
STREET LAMPS AND AUTOMATIC CONTROLLERS.
EDINBURGH.
(See p. 264.)

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

BENZOL PLANTS FOR GAS-WORKS.

BAGLEY, MILLS, & CO., Ltd.,
92, Victoria Street, Westminster, S.W. 1, Invite inquiries from all Gas-Works making 75 million cubic feet and upwards per annum.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CHEMICAL PLANT ENGINEERS, BOLTON, LANCS.
Telegrams—"SATURATORS, BOLTON." Telephone 0848.

MEWBURN, ELLIS, AND PRYOR.
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70, Chancery Lane, London.
Telegrams: "Patent, London." 'Phone: 243 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—
BALE AND HARDY,
89, VICTORIA STREET, WESTMINSTER, S.W. 1.

"FERROX." "FERROX." "FERROX."
A BRITISH Oxide Cheaper and Better than Bog Ore. 35 per cent. Water, 75 per cent. Ferric Hydrate.
For Sale outright or on Loan.
OXIDE LIMITED, Brentford, MIDDLESEX.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

SULPHURIC ACID.
SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.,
Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—1588 AVENUE (3 lines).

BRITISH GAS PURIFYING MATERIAL.
ENGLISH BOG ORE AND NATURAL HYDRATED OXIDE OF IRON.
SPENT OXIDE BOUGHT.
BRITISH GAS PURIFYING MATERIALS CO., LTD.
(W. T. P. CUNNINGHAM, Chief Proprietor and Managing Director.)
13, ARCADIAN GARDENS, WOOD GREEN, LONDON, N. 22.
Telegrams: "Bripurimat, Wood, London."
'Phone: Palmer's Green 608.

EXTENSIONS.—Gas-Works requiring Alterations or Additions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, 15, Park Row, Leeds, who make a Speciality of Gas Apparatus, Coke-Oven Plant, and Structural Steel Work. Inquiries Solicited. Satisfaction Guaranteed. Telephone No. 22579, LEEDS.